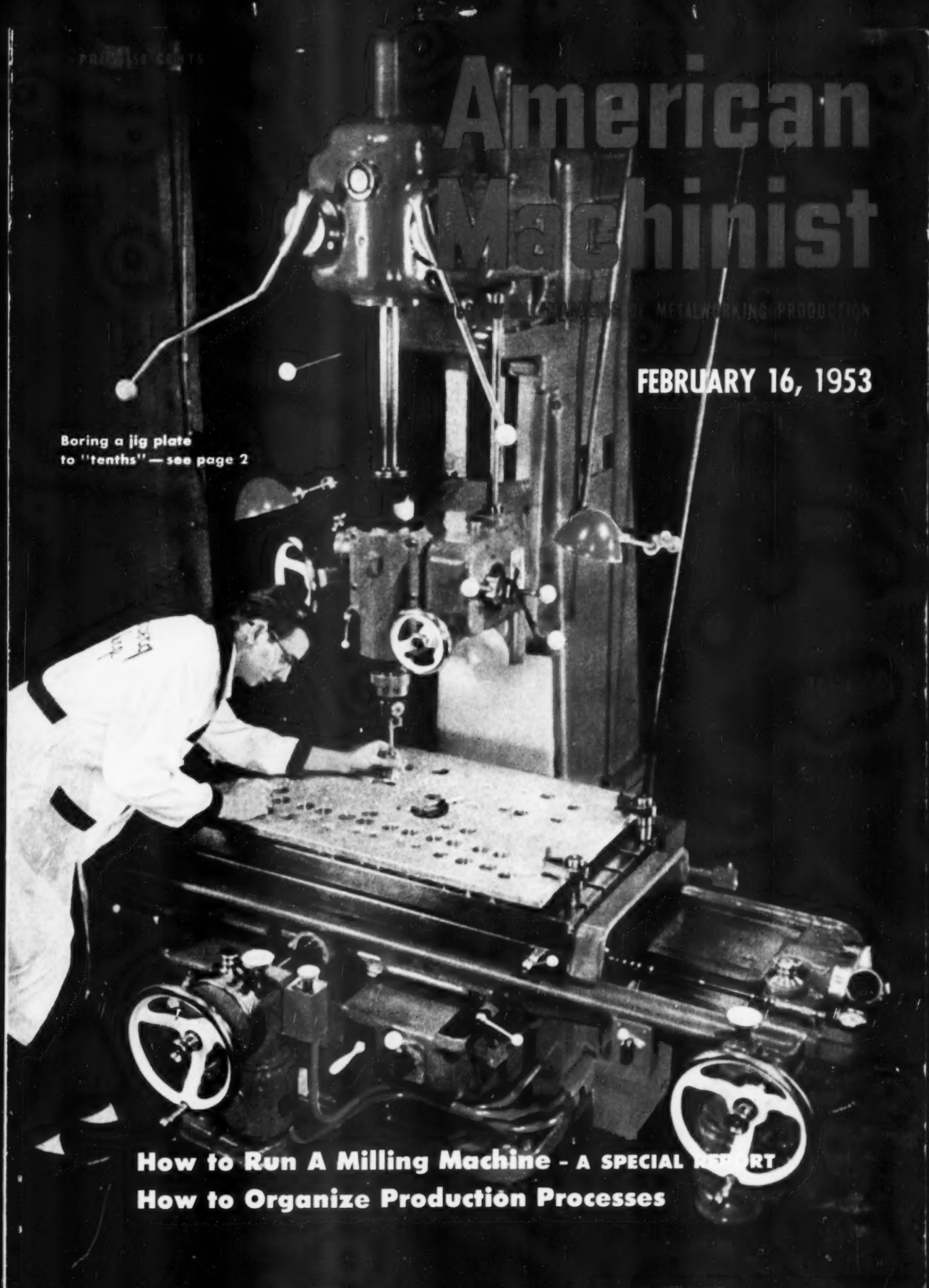


American Machinist

METALWORKING PRODUCTION

FEBRUARY 16, 1953

Boring a jig plate to "tenths" — see page 2

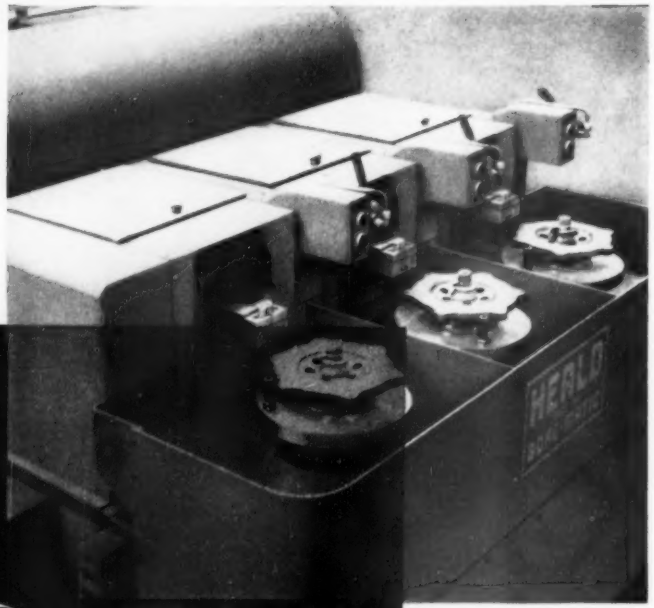
How to Run A Milling Machine - A SPECIAL REPORT

How to Organize Production Processes

3-in-1 vertical spindle Bore-Matic

permits

CONTINUOUS CLUTCH PLATE PRODUCTION



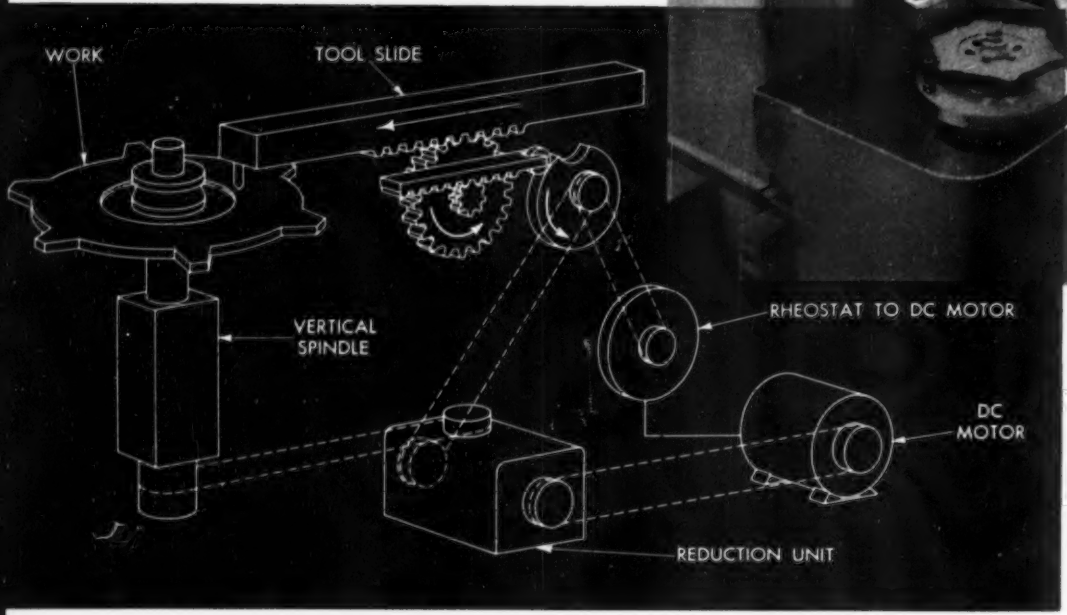


Diagram at left illustrates cam slide arrangement used on each of the three stations of the Heald model 243 Bore-Matic shown above. In addition to controlling tool slide feed rate, cam also progressively increases rotational speed of part as tool travels from outside to inside diameter of work — resulting in constant surface feet per minute.

Cam operated tool slides give constant surface feet per minute for entire facing operation

■ With this three-station, model 243 vertical Bore-Matic, automotive clutch plates are precision faced on a non-stop schedule. Each station operates independently. Parts can be loaded and unloaded on one station while the others are in operation. Machine features convenient work height, pneumatic clamping and push-button controls.

To provide constant surface feet per minute, the cam-operated tool slides are arranged for positive, synchronized control of both tool feed rate and rotational speed of the work. This arrangement, shown in the diagram above, assures a consistent, uniform finish over the entire borized surface of the plate.

Tools are easily adjusted by means of index marked screws on the top of the tool blocks. Rotating, air-operated "C" clamp fixtures are mounted on extended vertical-spindle boringheads. Fixture clamp levers are adjacent to each push-button station for ease and convenience of control.

Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Case Study
No. 2235—96 in
PRECISION PRODUCTION

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

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Chips and QUIPS

Our Cover . . . Holes are bored to "tenths" tolerances in jig plates for large multiple-spindle heads at the plant of Hertzberg Corporation, Milwaukee. Our cover Ektachrome shows the job being done on a Cleereman Model C-1836 jig borer, equipped with prepositioning power rapid traverse for table movements. The picture was taken by Hans Zielke, who will be remembered for his covers from Woodward Governor and A O Smith several years ago.

Production Organization . . . Agostino Sanvenero of Olivetti & Co, Ivrea, Italy, has prepared a second article for us, this one showing application of mass-production methods to medium-production requirements. He uses office equipment as his example, and explains a novel type of miniature transfer machine, and the reasoning behind a decision on whether to use special machines.

CO_2 + SiC . . . Cadillac tank has been using carbon dioxide as a coolant in grinding toolbits, finds that it makes silicon-carbide wheels usable in some cases where they wouldn't work without it. Two engineers collaborated on a detailed technical description of the process, plus good pictures.

For Diamonds . . . We've had several articles on alternates for diamond in grinding carbides; now F J Lennon, Jr, supt of Kennametal, presents the case for diamond wheels, shows economic factors must govern wheel selection. He gives facts and figures that are startling, in a 6-page fold-out insert.

Poor Organization . . . Even in the small shop, confusion, overdue jobs, misunderstandings, and other interruptions to smooth operation are probably caused by poor organization. Things assumed to be human problems may be caused by lack of clear-cut lines of authority and responsibility or something similar. George S Odiorne of Rutgers University gives the principles of good organization and training to be applied for a smooth-running outfit—in one page.

Tooling . . . Several shorts in this issue will catch the eye of the tool engineer. Paul H Prikos, chief engineer of Weiland Tool & Mfg Co, Chicago, gives significant features of shaving dies in the latest article in our NTDMA series. Such a die removes less than 10% of stock thickness, so producing good edge quality is not easy. Die accuracy is essential. The most important factor, regardless of die cost or type, is clearance . . . There's also an interesting page on carbide-faced jacks to hold parts from slipping on a faceplate, and another on holding small parts on a magnetic chuck . . . A fourth article describes a small press that rivets a pure silver contact to an 0.003-in.-thick beryllium-copper spring. Output was boosted 500%.

Milling . . . With the 16-page Special Report on How to Run a Miller in this issue, Associate Editor Jim Linsley completes his new series on Tools of Our Trade. They're intended for your apprentices and new operators and will shortly be assembled in a compact booklet. This particular Report deals with the fundamentals of the standard milling machine.

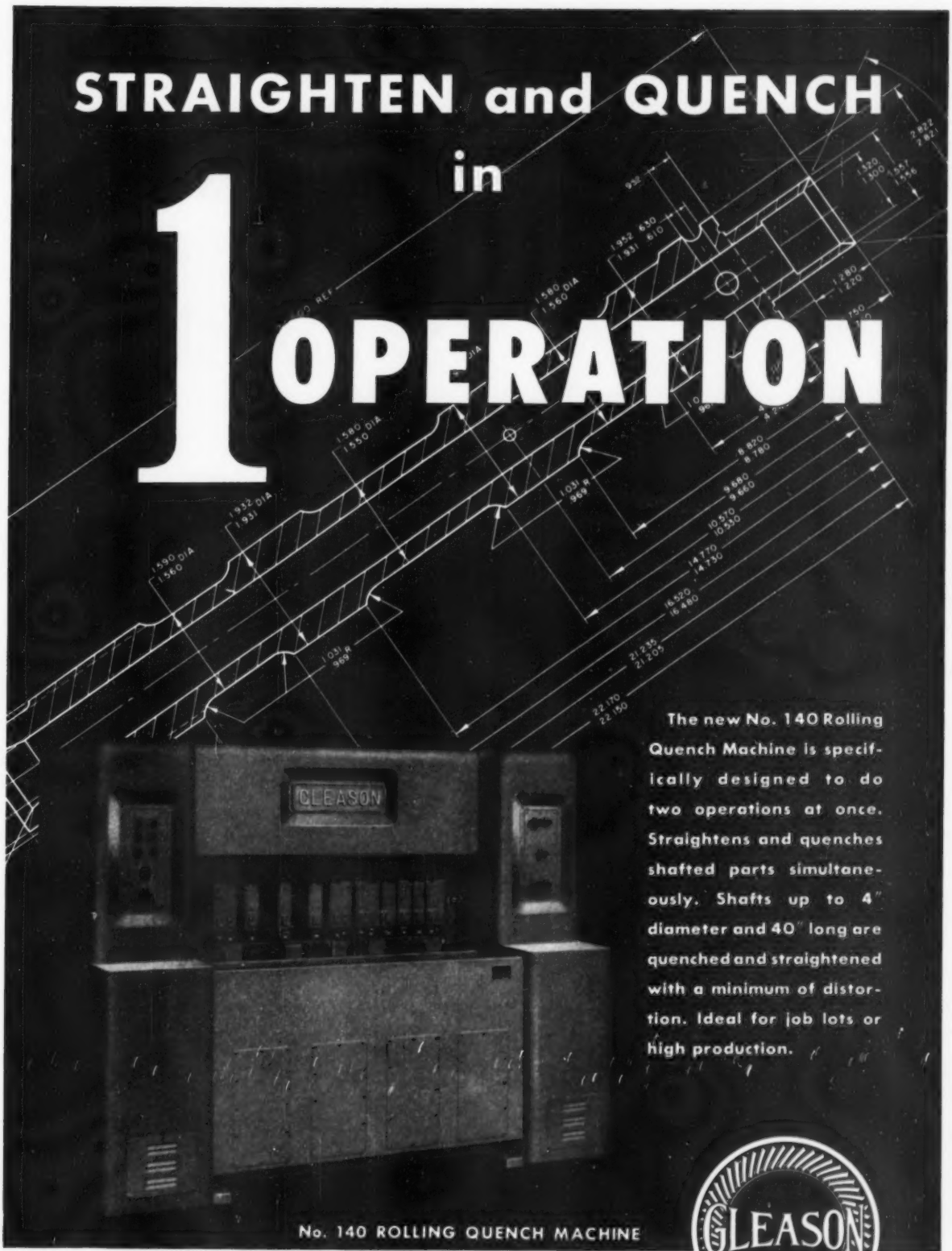
GE on Ti . . . V L Coughlin of the Aircraft Gas Turbine Division, GE, has finally put together a summary of all the work GE has been doing on titanium for the past two years. He found that conventional methods often won't work and here outlines GE methods for forging, swaging, turning, grinding, milling, tapping, drilling, and broaching. It's a 6-pager, with pictures.

Coming . . . Mar 2 *AM* will include a Special Report on non-destructive testing and initiate a new series on abrasive-belt grinding. There'll also be articles on a coordinate-setting machine, on a mechanical holder for carbides, on coated braze metal, on a progressive die with tapping heads, and on tolerance charts for gear making.

KEYSTONER . . . **F J Lennon, general superintendent of Kennametal Inc, has lived in the Keystone State all his life. Born in Pittsburgh Nov 29, 1916, he served his apprenticeship at Walworth Company, Greensburg, Penn, then worked his way up to tool engineer in charge of all toolmaking and tool designing. He is now in charge of all production operations at the Latrobe and Kingston Station, Penna, plants of Kennametal.**

"Pat" is president of the Westmoreland County Mfrs Assn and of the Latrobe Jr Chamber of Commerce, and a member of the ASTE. He makes his debut in AM with his this-issue story on tests of grinding carbides with diamond vs silicon-carbide wheels.

STRAIGHTEN and QUENCH in 1 OPERATION



The new No. 140 Rolling Quench Machine is specifically designed to do two operations at once. Straightens and quenches shafted parts simultaneously. Shafts up to 4" diameter and 40" long are quenched and straightened with a minimum of distortion. Ideal for job lots or high production.

No. 140 ROLLING QUENCH MACHINE

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

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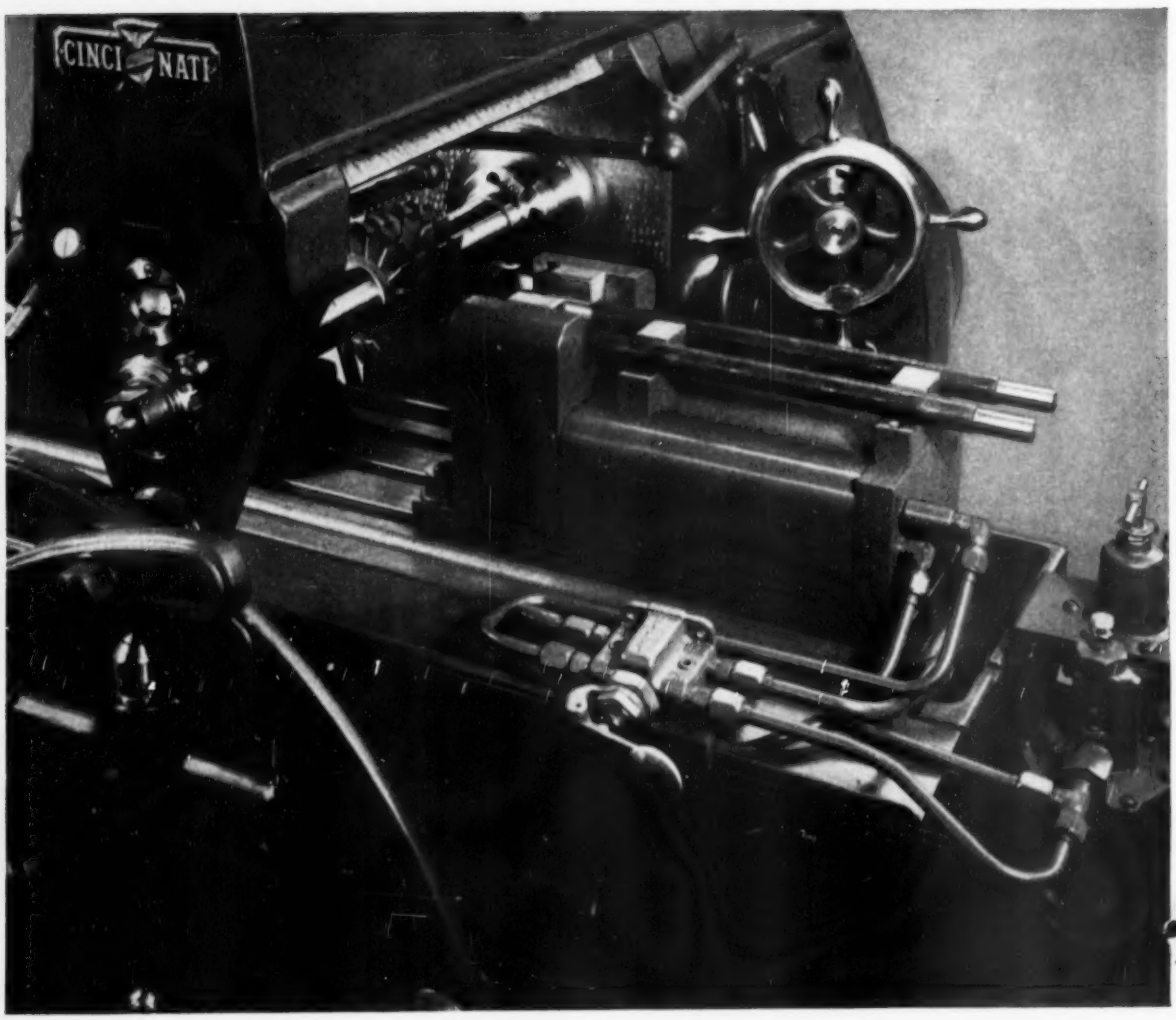
PRODUCTION ZOOMS to 800 per



CINCINNATI No. 1-18 Plain Automatic Milling Machine. Catalog No. M-1552-2 containing complete specifications will be sent on request.

hour

On Standard Cincinnati Automatic with Simple Tooling

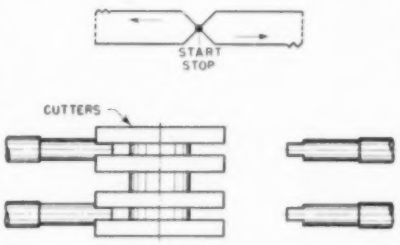


Diagram of setup and automatic cycle.

production data

Part name	Shaft
Material	Steel
Operation	Mill flats on end
Depth of cut	⅛"
Cutters	4" diam. H.S.S.
Production	800 per hour
Machine	CINCINNATI No. 1-18 Plain Automatic Milling Machine

CINCINNATI

A fast automatic machine with simple, efficient tooling can do wonders in reducing costs and raising production to almost any reasonable figure. In the example illustrated on the opposite page, Cincinnati Application Engineers were working with a very brief milling operation on the end of a shaft. To realize the lowest cost and highest production, they chose a fast automatic—CINCINNATI No. 1-18 Plain—and equipped it with two air operated fixtures with a "hip" control button and a gang of four cutters. Upwards to 800 shafts per hour can be milled on this equipment. ¶CINCINNATI No. 1-18 Plain Automatic Milling Machines offer several advantages for work of this type. (a) Automatic backlash eliminator for down-milling operations, or alternately up and down milling. (b) Automatic spindle stop protects the operator while reloading fixture. (c) Fast automatic table cycles, with 300" per min. rapid traverse to minimize "cutting air."
Other advantages for production milling operations within a 3 hp range are outlined in Sweet's Catalog File for Mechanical Industries. Complete data may be obtained by writing for catalog No. M-1555-2.

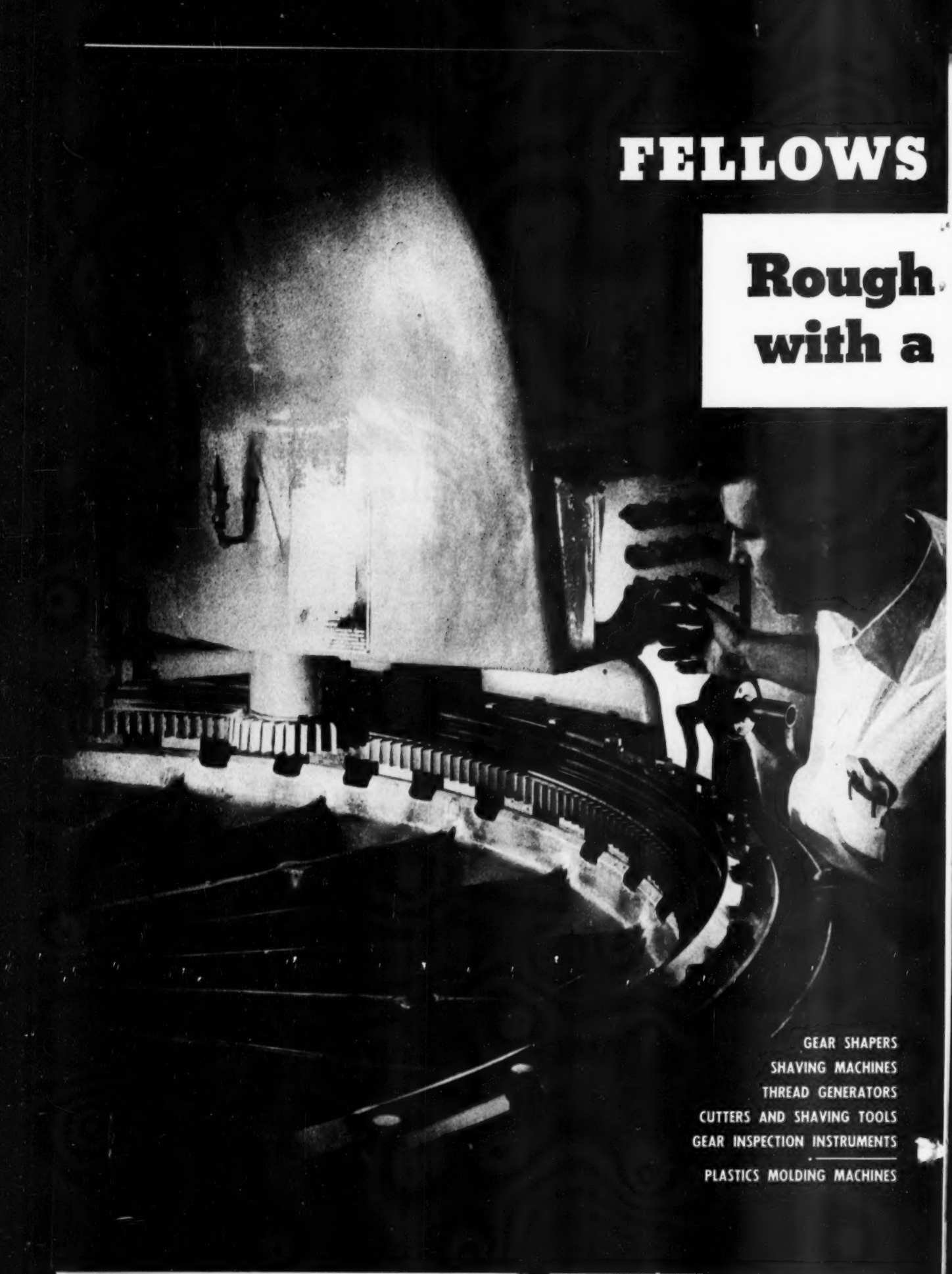
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

FELLOWS

Rough with a



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

120" GEAR SHAPERS

and Finish Single Set-up!

Giant tank turret gears being accurately generated on Fellows 120" Gear Shapers at the Chrysler Delaware Tank Plant.

These gears are roughed and finished in two cuts at one setting of the work. Easily accessible fixtures, rigidly supported, reduce handling time and permit the use of increased cutting feeds to speed production. Tool maintenance costs are low because the cutters can be sharpened on any standard rotary surface grinder.

For speed and fine finish at the lowest practicable cost on either intermediate or larger gears, investigate the Fellows 36-Type, 48-Inch, or 100-Inch Gear Shapers. Write or call the Fellows office nearest you.

Fellows

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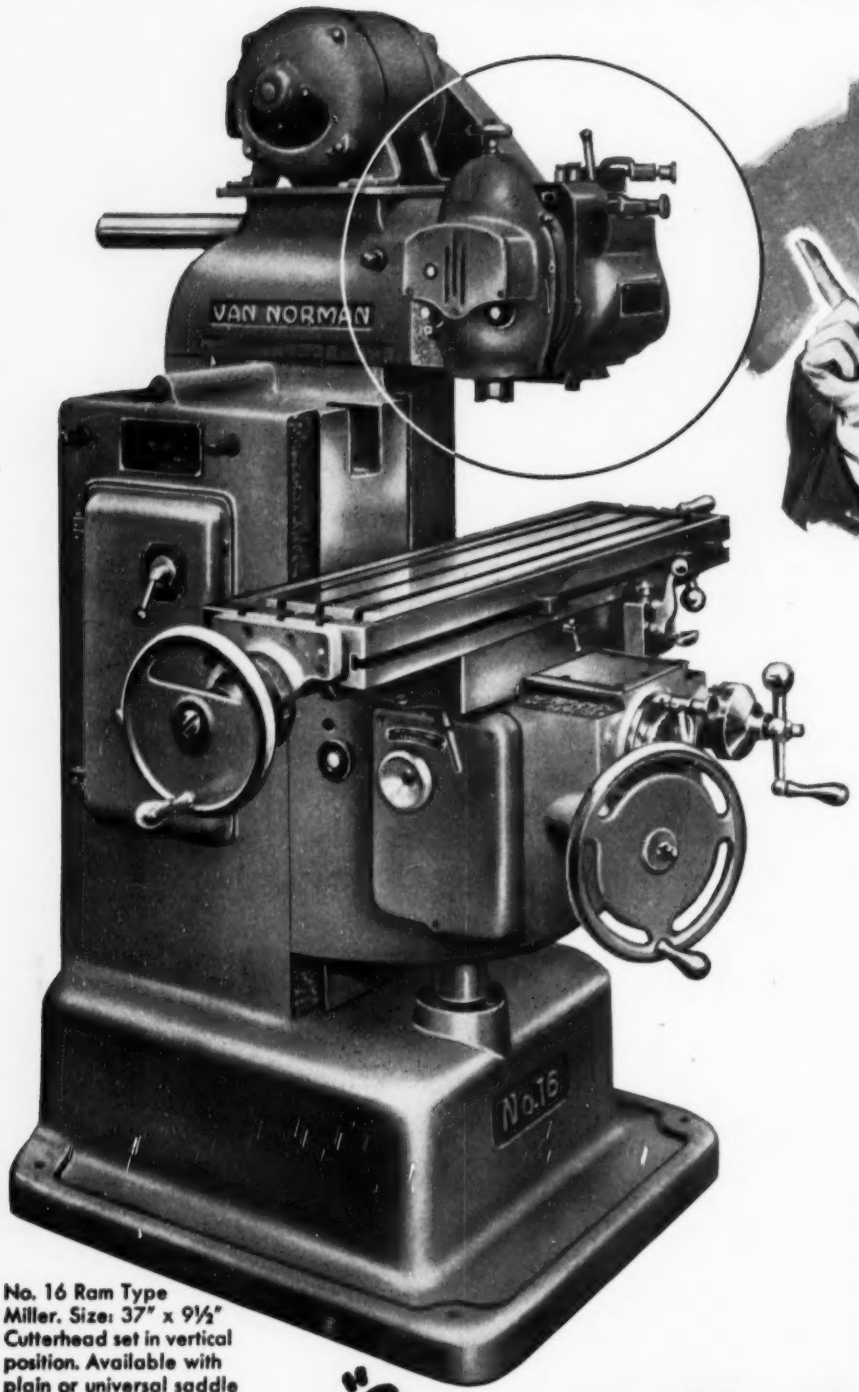
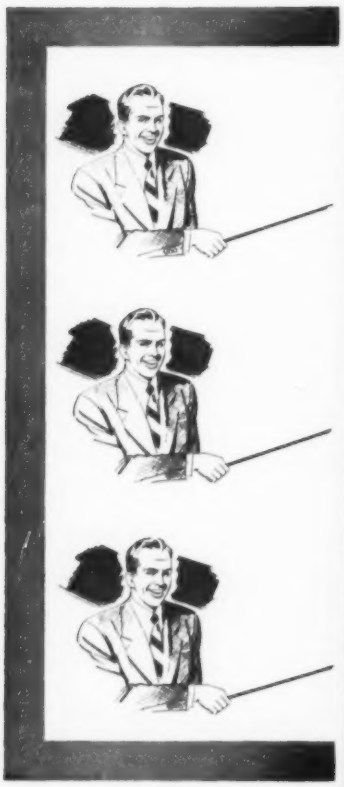
"See what the





No. 16 Ram Type Miller. Size: 37" x 9½" Cutterhead set in vertical position. Available with plain or universal saddle

"It pays to Van Normanize"

Adjustable Cutterhead

Can Do For You...

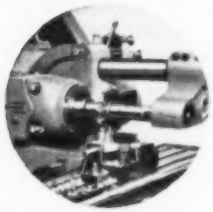
...and you will buy VAN NORMAN Ram Type Millers"

Van Norman Ram Type Millers give you every advantage for reducing milling costs. The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The movable ram plus the saddle cross feed increases the work range and capacity of these millers . . . enables you to handle larger work pieces with ease.

There is no waiting for single purpose machines because practically all milling operations can be accomplished on one Van Norman Ram Type Miller.

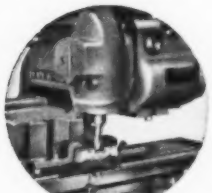
Whether it is for tool room, production line, machine shop, tool and die shop, or laboratory work, Van Norman Ram Type Millers will increase your production and cut costs.

Here's how one Van Norman Ram Type Miller does the work of three single-purpose machines.



HORIZONTAL MILLING

With the cutterhead locked in horizontal position, the Van Norman Ram Type Miller is used for horizontal milling operation. Hardened stop set at the factory assures positive 0° setting.



VERTICAL MILLING

The illustration above shows the Van Norman Ram Type Miller as it is used for a vertical milling operation. Permanently fixed hardened stop permits easy, accurate positioning of the cutterhead at 90°.

ANGULAR MILLING

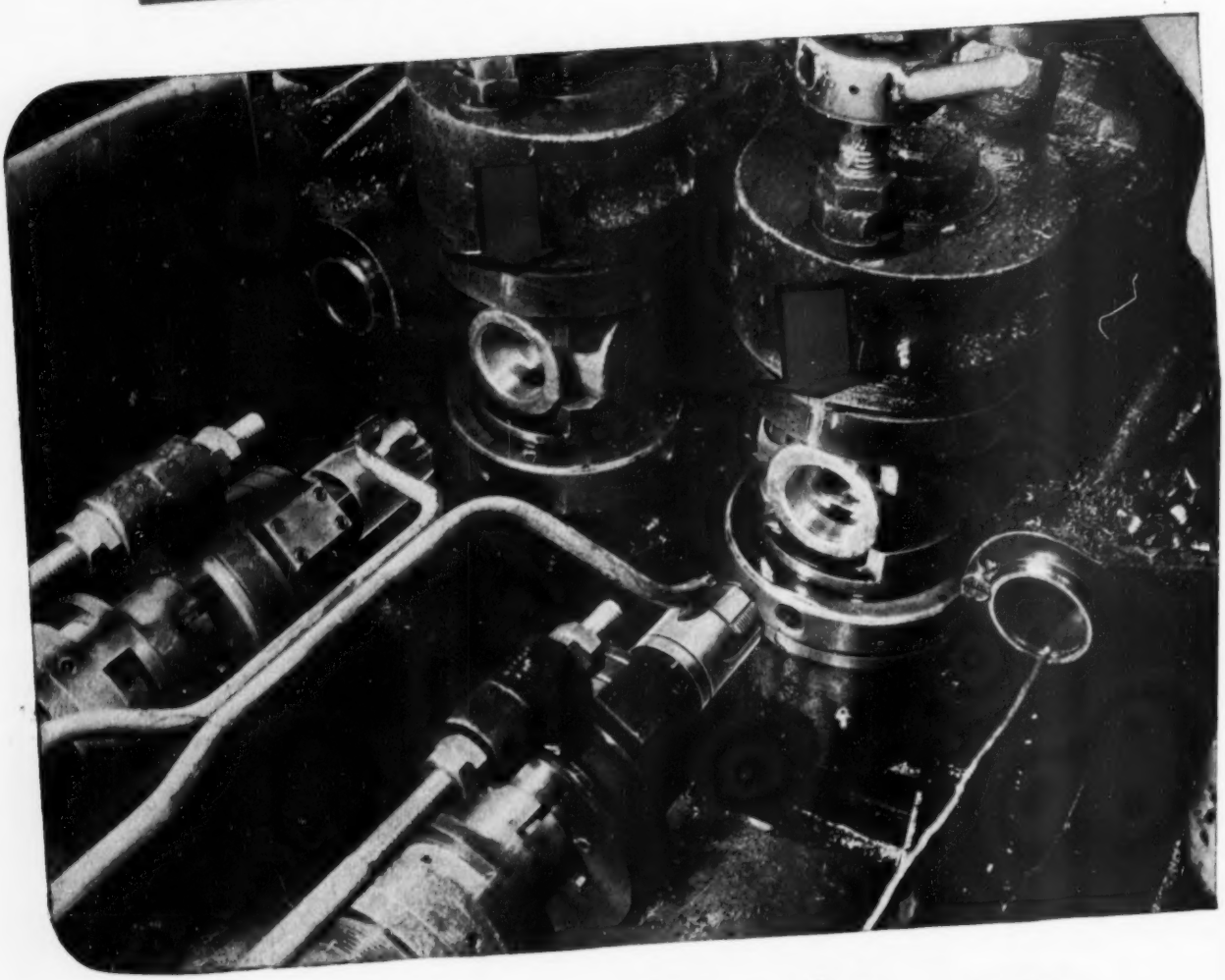
Here the adjustable cutterhead is set at 45° angular milling position. Horizontal, vertical or angular milling. All are easily performed on the Van Norman Ram Type Miller.

Van Norman Ram Type Millers are available in 6 basic models — No. 12, Table: 37½" x 9⅛"; No. 16 Table: 37" x 9½"; No. 22L Table: 45" x 10"; No. 26 Table: 58" x 13"; No. 36 Table: 64" x 14"; No. 38 Table: 64" x 14".

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS



The LANDIS Machine CO.

THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD

33HC

TAP

MASS-PRODUCES THREADS RATED FOR 6,000 POUNDS PRESSURE ! !

W-S forged steel pipe fittings guarantee the uninterrupted flow upon which the economy and safety of modern service and process piping lines depend. LANDIS Taps are regularly used by the Watson-Stillman Fittings Division, H. K. Porter Company, Inc., of Roselle, N. J., to cut the precision threads in these fittings required to withstand high pressures without leak.

In the illustrations, LANDIS LL Rotary Taps on a special drilling and tapping machine are threading W-S 2" 90° Pipe Elbows. 2" 11½ pitch ASTP threads are tapped in steel forgings at the rate of 35 surface feet per minute. Even at this speed 4000 threads are completed between chaser grinds, holding tool cost and downtime to a minimum.

LANDIS LL Taps are designed for the high-speed production of precision tapered threads. The taper of the threads is mechanically controlled by the receding action of the chasers. Cutting strains are thereby reduced, thread accuracy and finish improved, and chaser life lengthened. The design of the ALM Head features unevenly spaced chasers which provide maximum rigidity and prevent chatter.

Detachable heads allow each size of Tap to produce a wide range of thread diameters. For example, the 2" LL Tap with different size heads will cut pipe threads from 1" to 2½". Both Rotary and Stationary models are built in sizes up to 13⅜". For further information, send specifications and ask for Bulletin G-95.

50TH ANNIVERSARY

WAYNESBORO PENNSYLVANIA

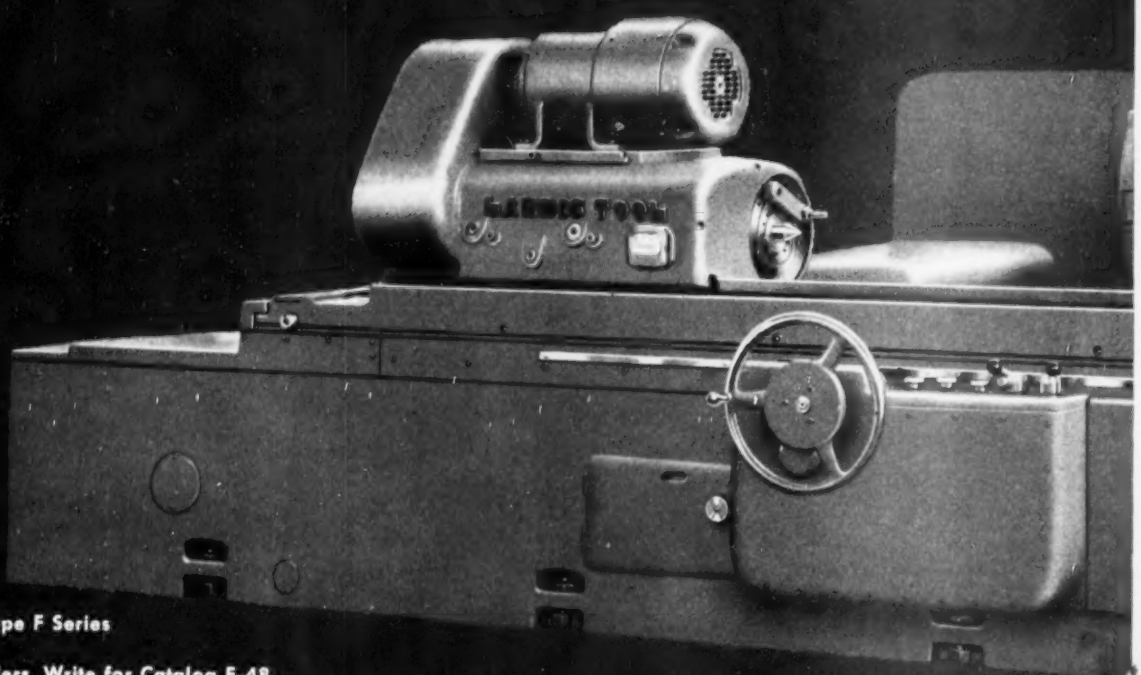
GENERATING EQUIPMENT

331-C

Heavy Cuts to Close Tolerances Shorten Grinding Cycle on Big Jobs

Exclusive Landis Features increase output without sacrifice of accuracy or finish

- **Microsphere Spindle Bearing**
- **Reinforced Wheel Spindle**



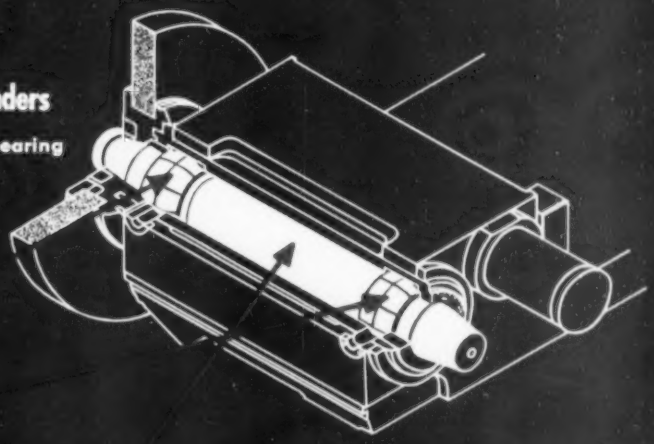
LANDIS Type F Series

Plain Grinders. Write for Catalog F-48.

LANDIS TOOL COMPANY, WAYNESBORO, PENNA., U.S.A.

Here's why you can take heavy cuts — grind fast with Landis type F series grinders

Cross section of wheelbase shows microsphere bearing and spindle assembly.



Microsphere Bearings

Close Clearance, Fast Grinding Cycle

Exceptionally close running clearance gives fast spark-out. Responds quickly and accurately to changes in wheel feed.

Reinforced Wheel Spindle

Extra Stiffness for Heavy Cuts

Increased diameter between bearings gives needed spindle rigidity for close tolerances and fine finishes.

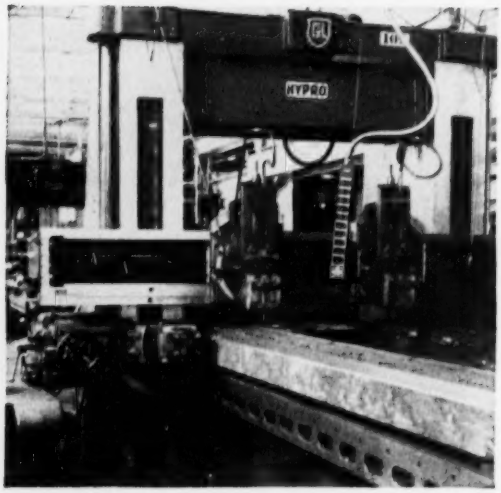
159

LANDIS

precision grinders

Planing semi-steel at 300 feet per

G&L Hypro Planer's power and rigid construction permit year in, year out, optimum accuracy in high speed carbide cutting to 1" depth at feeds from 3/64" to 1/8"

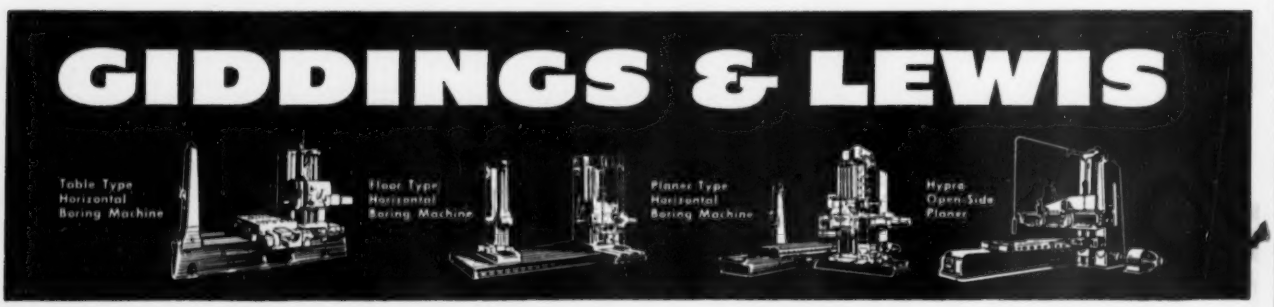


This photo shows the G&L Hypro Planer's fourth cutting head. On this operation, all cutting heads are used — production is increased, setup time is minimized.

SINCE 1947, Rice Barton Corp. of Worcester, Mass., has been using two G&L HYPRO Double Housing Planers to produce parts for paper mill and textile machinery. With them, semi-steel castings (30 to 40% steel), are being planed at speeds from 240 to 300 surface ft. per minute . . . with depth of cuts from ¼ to 1 inch . . . feeds from .045 to .125 inch. Mild steel parts are being planed at the same speeds, but at a maximum depth of ½ in. and a feed of approximately .030 inch.

Though shock on the carbide tools is very great due to irregular contours and interrupted surfaces, no tools have been broken in nearly a year of operation. This economical use of carbide tools is primarily possible because the G&L planers have the following features — sufficient power, (50/100 hp variable voltage drives) — double helical table drive which provides a straight flow of power with no side thrust — rigid construction of rail as well as rail head — and inverted dovetail slide construction.

If you'd like to know how G&L machine tools can help you speed your work by taking advantage of the latest cutting tool developments contact your nearest G&L representative and he'll be glad to give you the details on the G&L Job Analysis Service. If you don't know where to reach him, write direct.

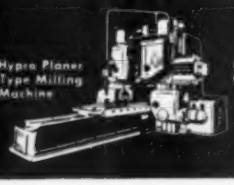

GIDDINGS & LEWIS
Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer

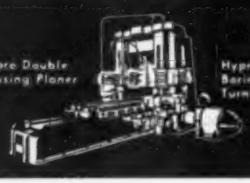
castings minute !

Rice Barton Corporation's G&L HYPRO Planers measure 78 by 72 inches by 20 ft. long and 66 by 56 inches by 20 ft. long and are powered by 50/100 hp variable voltage drives.

G-22

MACHINE TOOL CO.


Hypro Planer Type Milling Machine

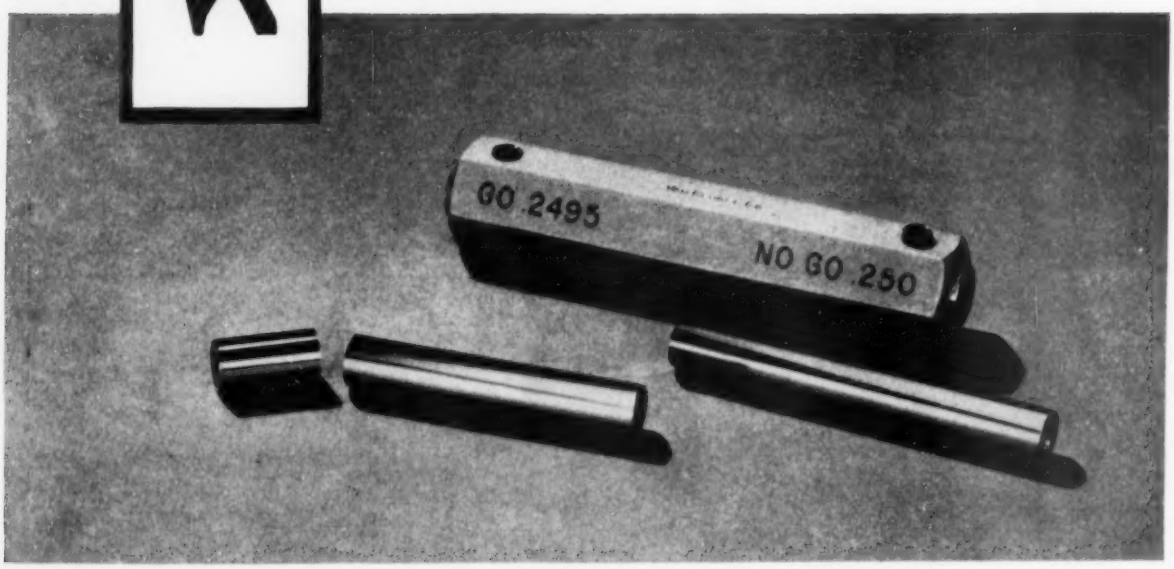

Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L HYPRO

FOND DU LAC
WISCONSIN

VK WIRE TYPE PLUG GAGES



VASTLY LONGER-LIVED *and* MONEY-SAVERS . . .

because they're "Cut-Off-Able" as well as "Reversible"

As a Van Keuren agent put it, "They're not only reversible, they're cut-off-able." And that means when you buy Van Keuren Wire Type Plug Gages, the sizes below ⅜" may be cut off when ends become worn and as many as from five to ten gages made available from the 1⅞" and 2" long units. It is not only economical and practical to use Van Keuren Gages but it is a very simple operation to cut off the ends by following instructions furnished on request. The illustration above shows clearly the cut-off and reversible features.

VK Wire Type Gages are available in ZZ to XX accuracies in sizes from .001" to 1.000". They are furnished in alloy tool steel, high speed steel, chromium plate or tungsten carbide. Whatever the gaging job, the extra length provided in VK units will save you money. It will also pay you to take advantage of VK deliveries. In many cases we can ship your requirements from stock.

VK Wire Type Plug Gages are fully described in Catalog & Hand Book No. 35, available on request by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

VK

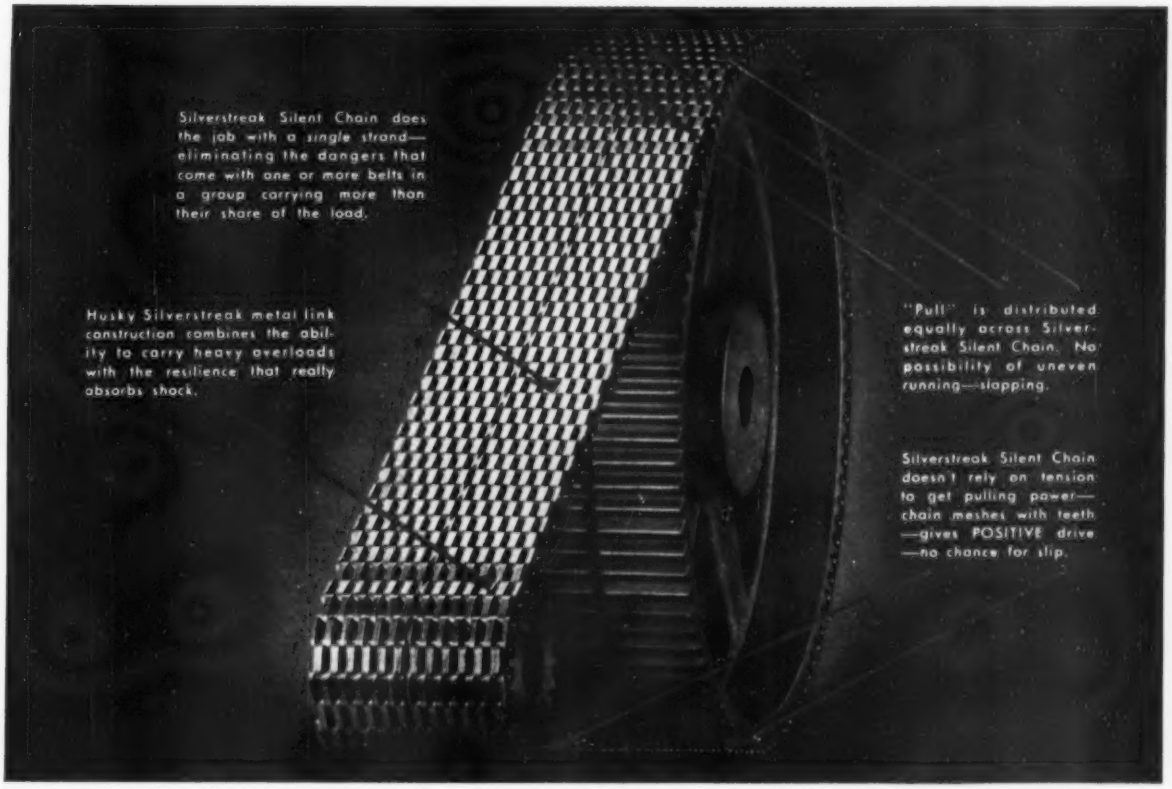
34th YEAR

THE *Van Keuren* CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Here's the proved way to transmit high hp at high speeds...


Silverstreak Silent Chain does the job with a single strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.
Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.
"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.
Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.

Link-Belt Silverstreak Silent Chain drives are slip-proof...slap-proof...shock-proof

ON thousands of applications . . . under all types of operating conditions—Link-Belt Silverstreak Silent Chain Drives have proved their effectiveness and durability. High horsepowers and high speeds are delivered with the same trouble-free efficiency (over 98 per cent) as on less demanding loads. There's a power-transmission engineer in the Link-Belt office near you.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

12,820

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.

As it has since 1940, a touch of the control button brings exact press speeds at the New York Herald Tribune. In those 12 years, there has been no replacement required on the two 100 hp Silverstreak Silent Chain Drives that power this press at chain speeds up to 3664 fpm.

Brand New

and

A STANDOUT FOR SPEED, CAPACITY AND TOP QUALITY LAPPING

Norton's Single Face Lapping Machine with Bonded Abrasive Laps Saves On Jobs Up to 60". . . A Sensational Performer Particularly On Soft Metals

Here's the greatest advancement ever made over old methods of lapping with loose abrasives. Norton's new single face, flat lapping machine combines a bonded abrasive lap with many other efficiency-boosting features to assure amazingly better, lower cost results.

You'll find these factors, plus ample capacity, make it the outstanding machine for lapping large castings of gray iron, aluminum, brass, magnesium and other soft metals. And on metals of every degree of hardness its faster, smoother performance will save you time and money throughout a long, trouble-free service life.

TYPICAL ADVANCED FEATURES

Hydraulic Pressure Device. Makes up for any lack of weight in work by applying correct compensating pressure for best lapping control.

Power Operated Truing Arm. Fully adjustable, providing slow to rapid traverse across lap. Simplifies maintenance of desired finish throughout the life of the lap.

Loadless Starting, Inertia Delay Clutch. Assures smooth pickup and even torque.

Automatic Operation. Requires only loading of machine and push-button starting to complete the electrically timed work cycle.

Large Capacity Range. Includes lap sizes of 48", and 60". Maximum size enables handling of three 24" pieces or one 60" piece (largest dimension).

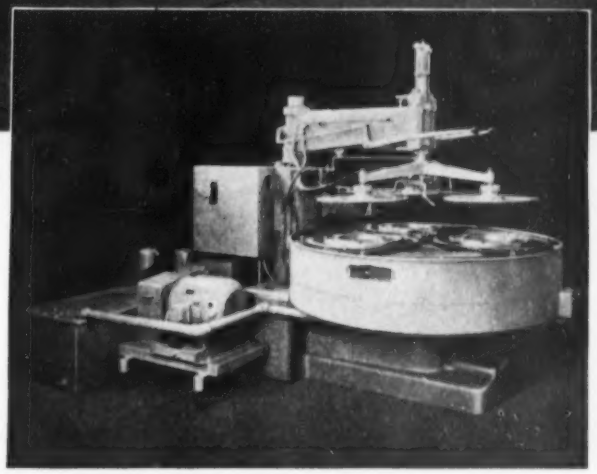
POSITIVE ADVANTAGES

Cleaner Work. Coated only by a thin, filtered oil, the surfaces finished by bonded abrasive lapping are free from the sludge left by loose abrasives.

Brighter Surfaces. Bonded abrasive lapping produces brighter surfaces on any metal, with no later polishing required.

Safer. By keeping the pores and crevices of the metal free from imbedded grit, the bonded abrasive enables

BONDED ABRASIVE LAPPING of aircraft engine housings reaches peak efficiency in the New Norton 60" Single Face Flat Lapping Machine. For faster stock removal, work is driven in opposite direction to its normal tendency to rotate.



HYDRAULIC PRESSURE DEVICE, shown in position, is used to apply additional lapping pressure for light work pieces.

safe lapping of soft metals to provide seal surfaces, wear surfaces, or surfaces for drilling or milling. This also eliminates the need of thorough cleaning after lapping, to rid surfaces of imbedded abrasive.

Faster. Cutting speed, on many materials, is 2 to 5 times faster than loose abrasive lapping for the same amount of stock removal.

More Accurate Products. The simple, positive lap-truing device results in maximum product-accuracy on every job.

Greater Economy. Bonded abrasive laps are long-lasting and easy to replace. A low priced coolant is used. Inspection tools are subjected to less wear than on parts lapped with loose abrasives. Labor expenses for extra cleaning and polishing operations are eliminated. And with Norton laps made to match Norton machines exactly, you get an unbeatable cost-cutting combination.

FOR COMPLETE DETAILS

see your Norton Representative or write us direct.
NORTON COMPANY, Machine Division,
Worcester 6, Mass.

To Economize Modernize With **NEW**

NORTON

GRINDERS *and* LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

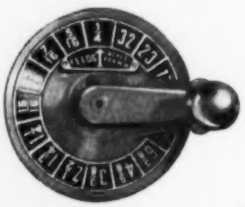
5 MINUTES PER VERSATILE NEW CH

KEARNEY & TRECKER MILWAUKEE

Speeds fabrication of aircraft parts from 75ST aluminum alloy

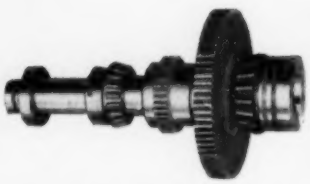
CH MILLING MACHINE FEATURES THAT HELPED INCREASE OUTPUT — CUT COST PER PIECE

Speed range — *16* speed changes are provided from *25* to *1500* rpm. Automatic protecto-mesh mechanism permits nonclash shifting during speed changes.



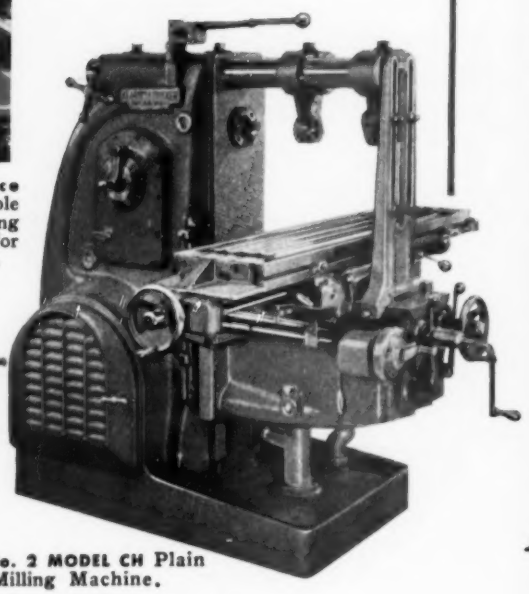
Extra-wide feed range — *16* feeds from ¼" to *32"* per minute meet requirements of new metals and cutting tools for most efficient operation.

Greater rigidity — Entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.



Greater cutting efficiency design refinements in 3-bearing spindle and a train of heavy duty, wide-faced, forged steel gears, hardened and specially processed.

Smoother feed performance through a heavy duty 2" dia. table feed screw. *23%* greater bearing contact between screw nut for longer screw life and accuracy.



5 hp No. 2 MODEL CH Plain Style Milling Machine.

INVESTIGATE the versatile new CH line of milling machines. Their features are job proven to give you cost-cutting results plus greater productivity, better finished products. Contact our nearest representative or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

PIECE WITH THIS MILLING MACHINE

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

HERE ARE THE FACTS ON THIS JOB:

Location: Mar Vista Engineering Co., Los Angeles, Calif.

Machine: No. 2, Model CH, 5 hp, Plain Style, used with Universal Milling Attachment.

Part: Aircraft fitting for horizontal stabilizer.

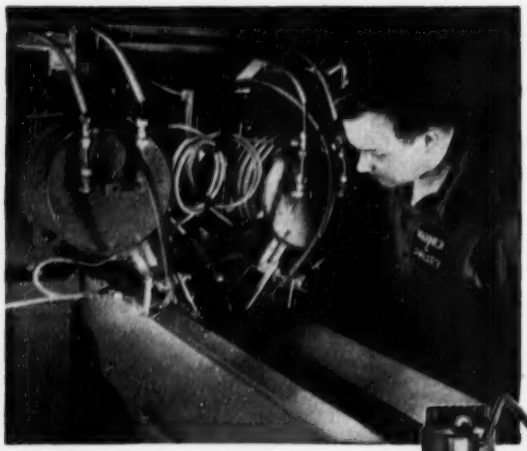
Material: 75ST aluminum alloy.

Cutter: One blade — 8" fly blade.

Cutter Speed: 875 rpm, 9 ipm feed.

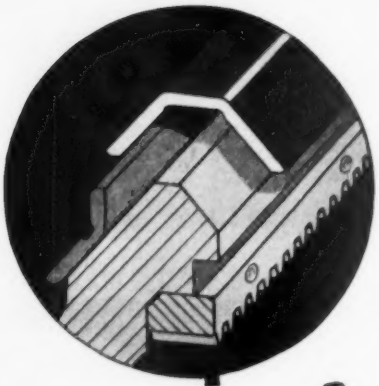
Depth of Cut: .050".

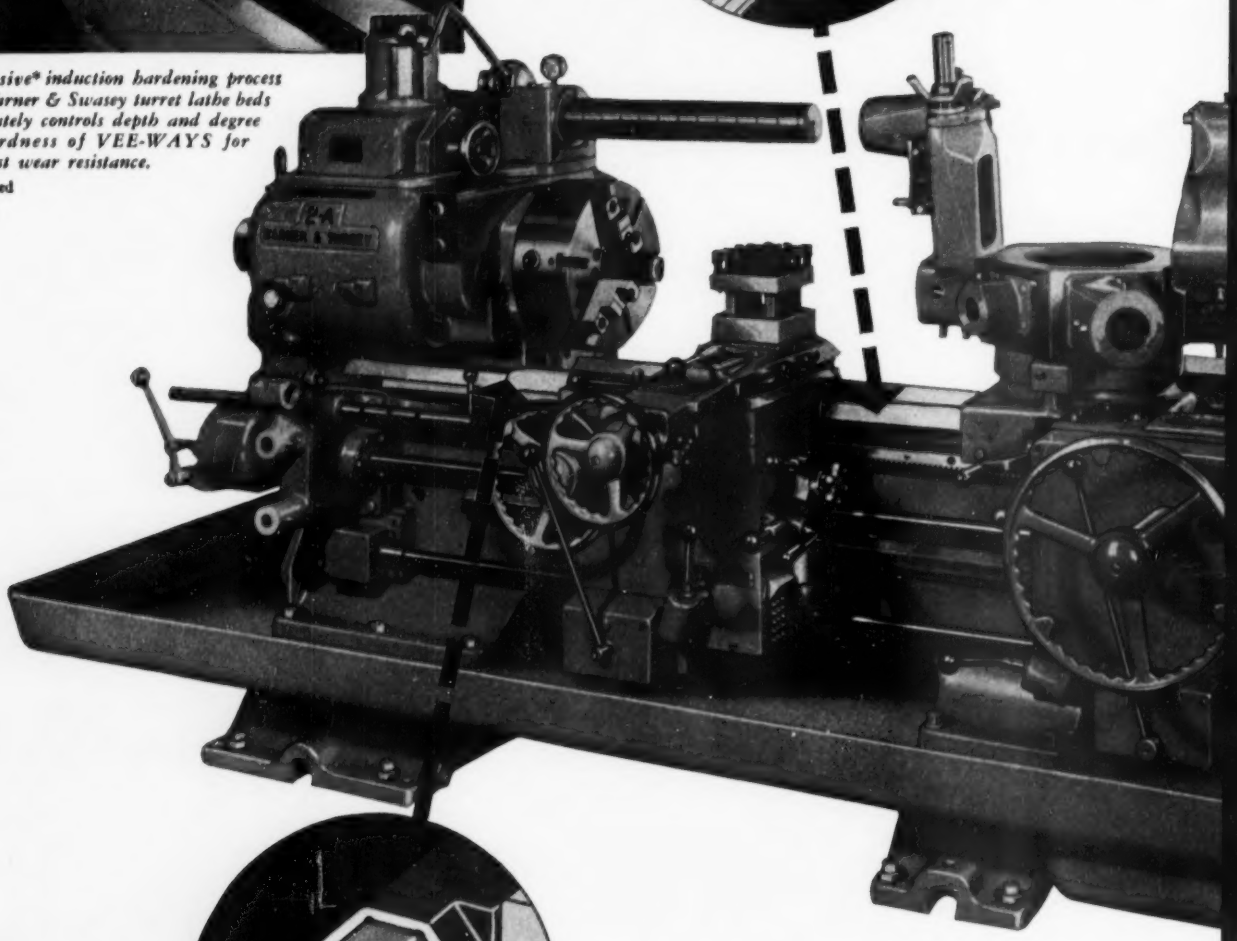
Production: 12 pieces per hour — all sides milled.

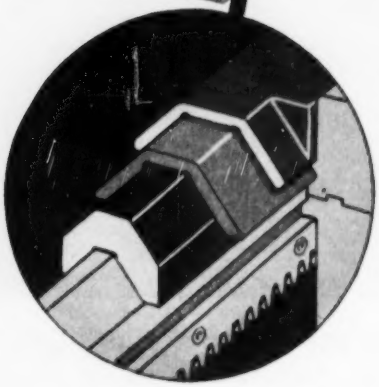


Exclusive induction hardening process on Warner & Swasey turret lathe beds accurately controls depth and degree of hardness of VEE-WAYS for greatest wear resistance.*

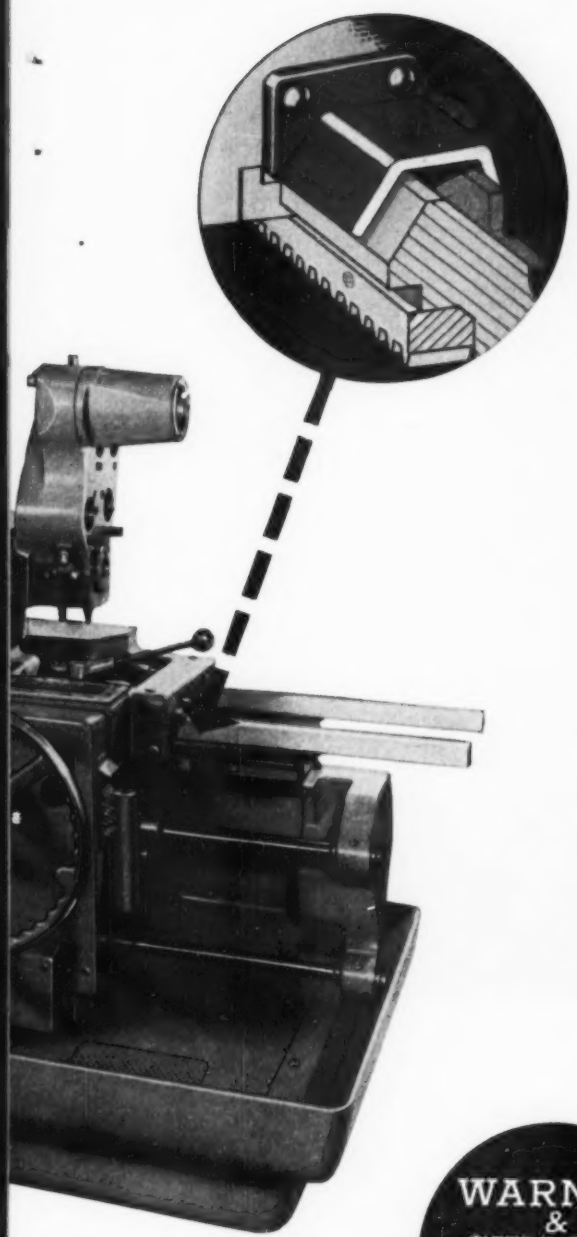
*Patented







YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY



FOR ACCURACY

there is no substitute for VEE-WAYS

NEW MACHINE ACCURACY is maintained for many extra years because of one basic design feature which is distinctive to all Warner & Swasey Saddle Type Turret Lathes.

VEE-WAYS are cast as an integral part of the Diagonal Ribbed, one-piece bed. After induction hardening by an exclusive process for greatest wear resistance, the VEE-WAYS are ground to precision smoothness. The most heavily loaded saddle slides over the ways with such ease that hand wheel control is almost effortless for the operator.

The VEE-shape distributes weight and pressure of saddle and loaded turret to make carriage self-aligning. The heaviest roughing cuts and the finest finishing cuts are taken without necessity of adjustment—without possibility of weaving.

Patented telescoping way covers (see diagrams) completely protect the VEE bed from scratches from chips or damage from dropped tools. Equally important, the way covers prevent the floods of coolant from washing away the film of lubricant carried to the ways by automatic lubrication.

VEE-WAY construction is only one of many distinctive Warner & Swasey features, but it represents a fundamental principle which makes Warner & Swasey Turret Lathes so easy to operate, and so outstandingly efficient in preserving extreme precision during long years of hardest service!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

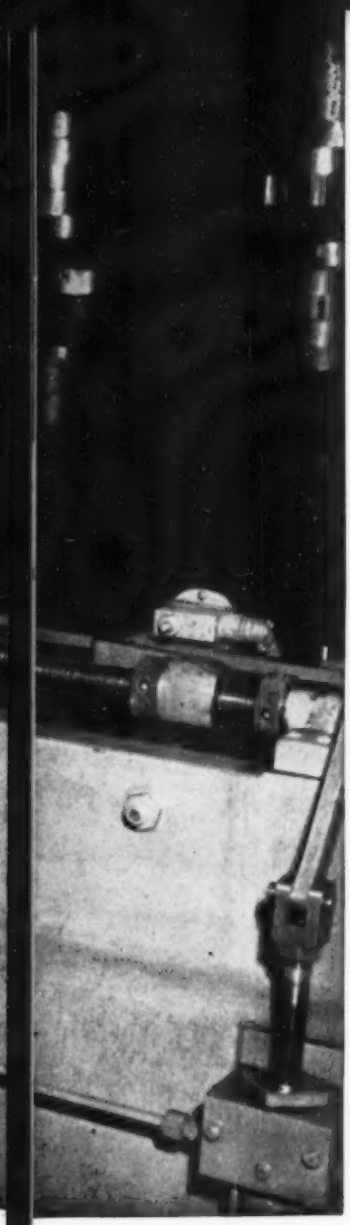
Easy on the draw

● Shown above is the drawing operation used by The Lock Joint Tube Co. in the production of automobile steering gear jackets. Two ¼-inch draws are made on steel tubing.

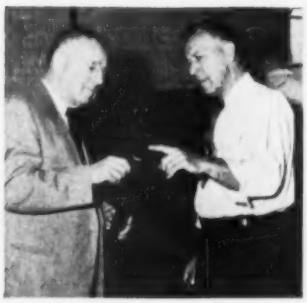
Dissatisfied with the performance of a conventional drawing compound on this job, operators took the advice of a Standard Oil lubrication specialist and switched to STANOSTAMP C Compound.

This product has met their needs on every count. It has proved economical to use because operators have been able to mix it with water and soluble oil and apply that mixture in light coatings to the steel tubing. STANOSTAMP C has provided better protection for dies, thus reducing wear. Draws are now made on over 2,000 pieces before dies require polishing. Although the drawn pieces are not cleaned until long after the drawing operation, there have been no rusting troubles.

Whatever your problem or need, you'll find, as did this midwest company, that a Standard Oil lubrication specialist can help you. He has a complete line of high quality cutting oils to offer and the training and practical experience to apply them most effectively. You can get his help quickly and easily by phoning your local Standard Oil Company (Indiana) office. Or write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.



What's YOUR problem?



Russ Jenkins (left), lubrication specialist in Standard Oil's South Bend office, helped the superintendent of this midwest plant improve a drawing operation through the use of a STANOSTAMP Compound.

Mr. Jenkins is one of a corps of able lubrication specialists who are located in Standard offices throughout the Midwest. These men have been specially trained in Standard Oil Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience. The specialist nearest your plant is ready to give prompt, expert, and thorough attention to your lubrication problems.

It's easy to obtain his services. A phone call to your nearest Standard Oil Company office will bring him quickly to your plant . . . with no obligation to you, of course.

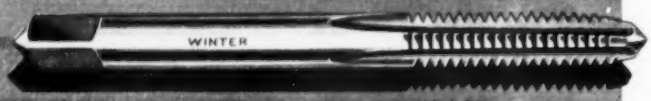
Spells "finish" for another cutting problem. A midwest manufacturer wanted better finish on steel valve seats. STANICUT Cutting Oil 117 BCS replaced a more expensive product on this screw machine job and produced the desired finish. It also extended tool life, resulting in lower tool cost and fewer tool changes.

Solution for a hard water problem. SUPERLA Soluble Oil has helped the U. S. Machine Corporation, Lebanon, Indiana, overcome a hard water problem. Mixed with the hard water used in the plant, SUPERLA Soluble Oil has given excellent results on jobs calling for the machining of cast iron. There has been no spoilage of the work due to rusting. Tool life has been highly satisfactory. Clean operation and freedom from odor development have provided desirable working conditions for machine operators.

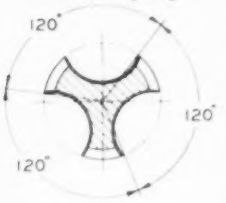
STANDARD

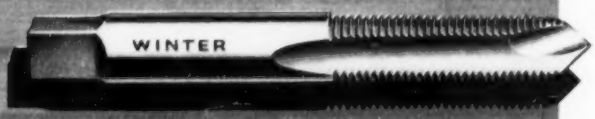
STANDARD OIL COMPANY
(INDIANA)

Uniform Flute Contours

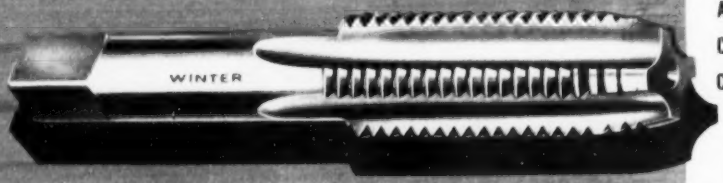


Exact Flute Spacing

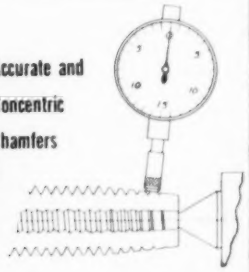




Precision Chip Driver Contours



Accurate and Concentric Chamfers



FOR "CLOSE-LIMIT" HOLES—

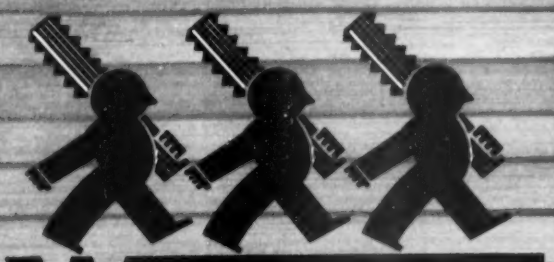
these carefully-manufactured Taps with

BALANCED Action

DO A FAVOR for some manufacturer on your list who is tapping holes to close limits. Show him the above picture-story about Balanced Action Taps.

You'll be talking to him in his own language.

He understands that *precisely accurate taps* are money-savers for him; they minimize his scrap losses and deliver *maximum tool life.*



WINTER

WINTER BROTHERS COMPANY

Rochester, Michigan, U. S. A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco.
Division of National Twist Drill & Tool Co.

FOR REMOVING METALS AT LOW COST—
these carefully-manufactured Twist Drills with
NATIONAL CUTTING EDGES
There are many manufacturers whose profits depend on drilling holes in a hurry.
These can be preferred customers for you when you supply NATIONAL TWIST DRILLS with their superior cutting edges and in-built ruggedness. That means long service life.
Sell the drill that gives your customers the cost-cutting edge . . . sell NATIONAL.
NATIONAL TWIST DRILL AND TOOL COMPANY
Rochester, Michigan, U. S. A. Distributors in principal cities.
Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco.
NATIONAL
NATIONAL
NATIONAL
NATIONAL
NATIONAL
NATIONAL TWIST DRILL & TOOL
ROCHESTER, MICH., U.S.A.
National

How many of your lathes should get a gold watch?

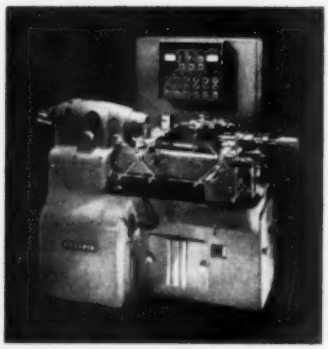
A lathe's retirement age, unlike people's, can't be determined by a set number of years of faithful service. It might be ten years . . . . eight . . . . or even one.

It boils down to a matter of comparison.

If you have a lathe that can't produce as much, as cheaply, as one of today's models —like the Monarch line—give it a watch! Then, for heaven's sake—*retire it!*

For today, more than ever before, operating costs are a major concern of every business. Today, higher output and low costs are real market factors—and provide the best reason in the world for wide-awake management to recognize obsolescence as an operating actuality.

Reward those tired old lathes with the gold watch of retirement. Then watch your new Monarchs make time! *The Monarch Machine Tool Company, Sidney, Ohio.*



Monarch—for almost a half-century a pioneer and leader in the development of fine lathes for production line and toolroom.

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

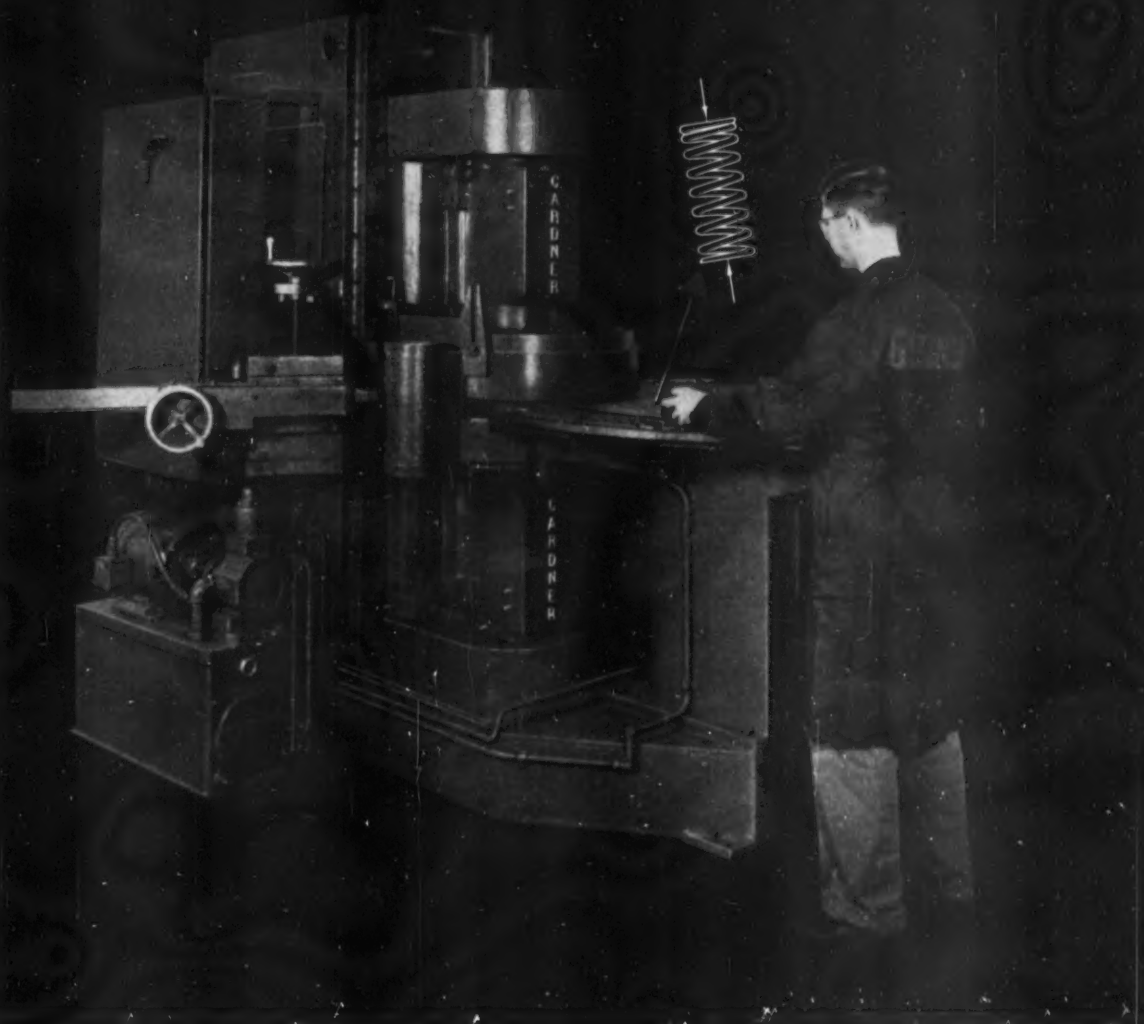
Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

GARDNER Grinders

precision discs

Grinds 2000 Coil Springs Per Hour

TWO parallel surfaces ground in **ONE** operation



120M

Write for new catalog

WORK DATA

MACHINE	Gardner No. 211 Vertical Double Spindle Grinder
PART	Coil Springs .715″ O.D. x .750″ long
MATERIAL	3/16″ wire
STOCK REMOVAL	Approx. .300″ over all
TOLERANCES	1/2° to 1° for squareness; .004″ for uniformity
PRODUCTION	2000 per hour

GARDNER MACHINE COMPANY

410 East Gardner Street · Beloit, Wisconsin, U. S. A.

Here's another reason it pays to get a proposal from Fosdick

We check flatness to 40 millionths

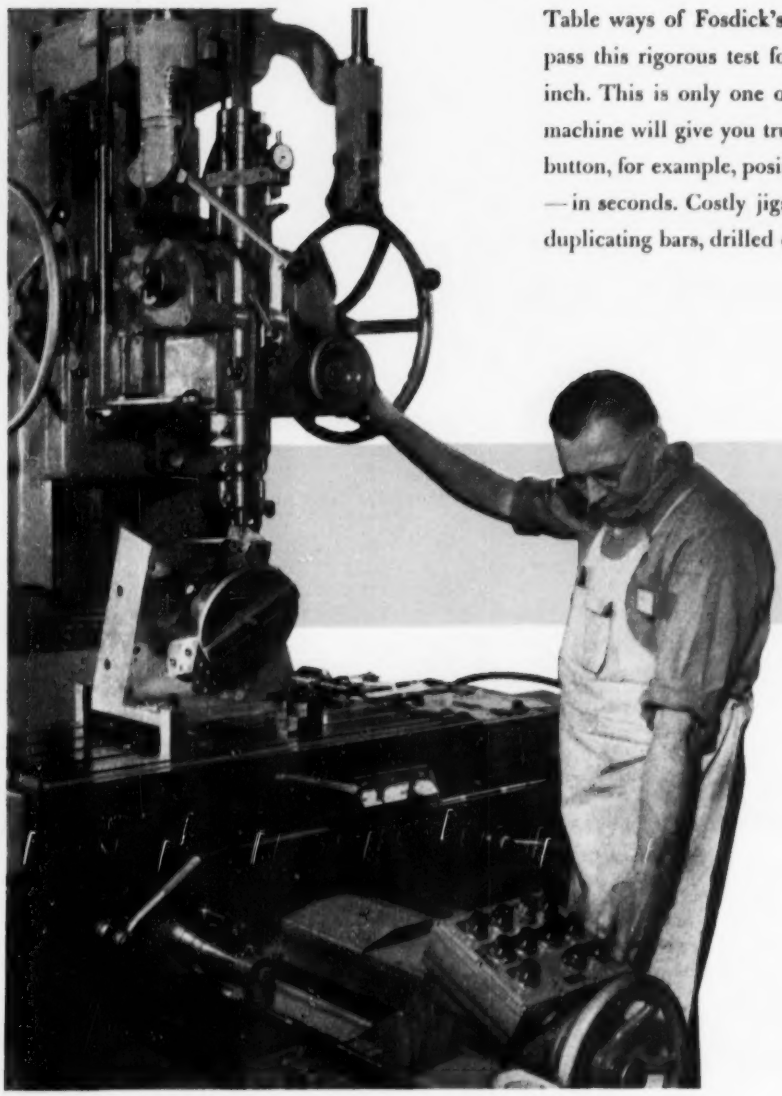


Table ways of Fosdick's Automatic Positioning Machine must pass this rigorous test for flatness—within 40 millionths of an inch. This is only one of many tests we run to make sure this machine will give you true precision production. The touch of a button, for example, positions work for each new hole to ± .0001" —in seconds. Costly jigs have been replaced by two 5/8" square duplicating bars, drilled quickly for the job, stored easily.

to give you

Boring Time "Nose Dives" at Fairchild.

Mass production of precision magnesium housings for commercial and military cabin pressurizers at Fairchild Engine and Airplane Corp. demanded speed and high accuracy. Fosdick's proposal recommended Automatic Positioning Machines. Now Fairchild drills, faces and bores 31/32" holes with accuracy to ± .0001"— *has slashed boring time 40% over former methods.*

For full description of the Automatic Positioning Machine ask for Bulletin APA.

precision production like this

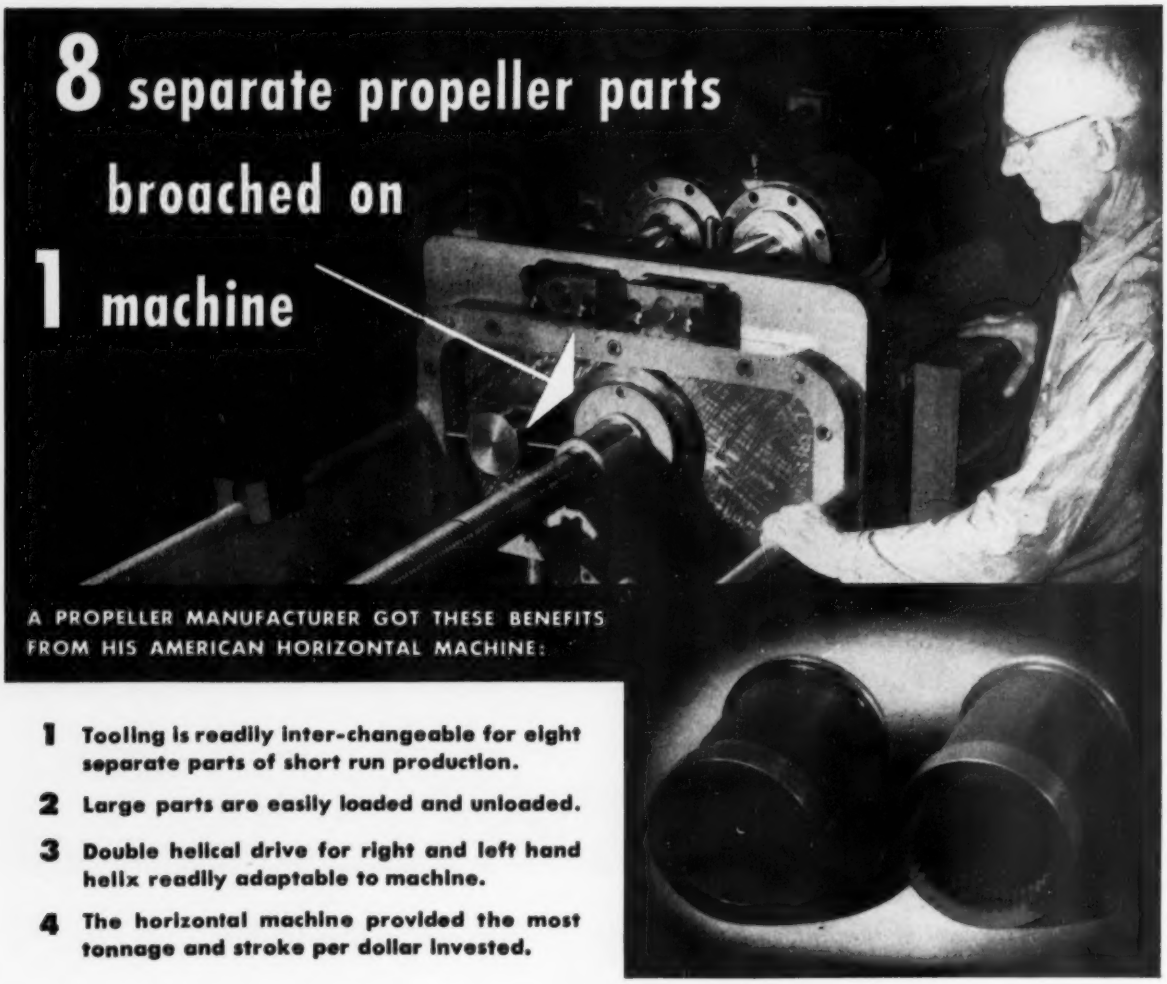
Need Drilling Equipment? Get a Proposal from Fosdick!

Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

8 separate propeller parts broached on 1 machine



A PROPELLER MANUFACTURER GOT THESE BENEFITS FROM HIS AMERICAN HORIZONTAL MACHINE:

1. **Tooling is readily inter-changeable for eight separate parts of short run production.**
2. **Large parts are easily loaded and unloaded.**
3. **Double helical drive for right and left hand helix readily adaptable to machine.**
4. **The horizontal machine provided the most tonnage and stroke per dollar invested.**

To broach the propeller sleeve gears, American built and equipped a standard HDE-30-72 horizontal broaching machine with six interchangeable lead bars for different internal spline operations. The machine broaches eight different propeller sleeve gears. Number of spline teeth vary from 43 to 55 with diameters ranging from 2¾″ to 3½″, and with length of splines cut ranging from ¾″ to 3″ long. Ask American which type of machine best suits your requirements. Just send a part print and hourly requirements for our recommendations.

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Production Pointers from GISHOLT

GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

SHOWS MODERN TREND IN BALANCING

Machine Balances And Corrects 100 Fans Per Hour

Today, industry *knows* the importance of balancing rotating parts, large and small. It's fast becoming a regular part of production...and *production* balancing more and more is combining the complete balancing process in *one* machine.

It's being done here:

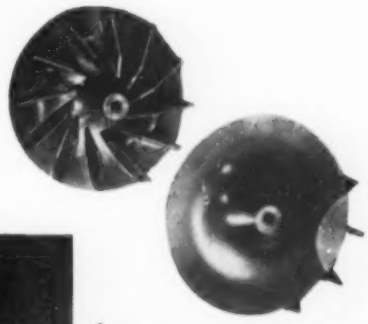
The part is a small fan for a well-known vacuum sweeper. One Gisholt DYNETRIC Balancer with correction equipment as an integral part of the machine, handles the full production—locating, measuring and correcting static unbalance at a rate of 100 fans per hour.

Locating and measuring unbalance is a matter of only a few seconds. The operator then turns the fan to the proper angle and turns a hand-wheel to correspond with the meter reading. At the press of a button, a fly-cutter removes the exact amount of metal to bring the fan into balance.

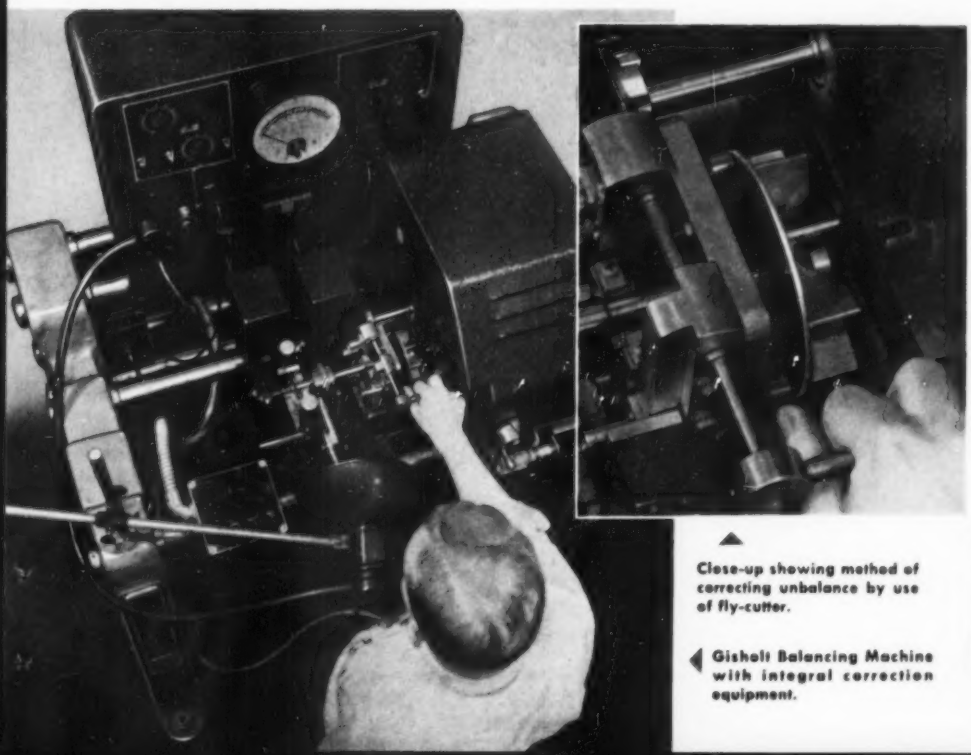
Thus, the *entire* job—locating and measuring unbalance, correction and inspection for over-all accuracy—is done in one operation. It saves handling. Only one loading is necessary.

With this entire balancing operation averaging only 30 seconds, the balancing cost is repaid many times by the greater smoothness, quietness and longer life of the fans.

DYNETRIC BALANCERS GISHOLT



▲ Front and back of fan with metal removed to correct unbalance.



▲ Close-up showing method of correcting unbalance by use of fly-cutter.

◀ Gisholt Balancing Machine with integral correction equipment.

HELPFUL INFORMATION on balancing is given in the article, "Static and Dynamic Balancing" from the latest A.S.T.E. Handbook. Will be glad to mail you a reprint.

BALANCING SCHOOL.

Ask for details and starting dates of the Gisholt Balancing School, industry's only complete training program.

GISHOLT

TIME-SAVING IDEAS

HOW CAREFUL PLANNING SAVES 2nd OPERATION

Two-Stage Setup on Simplimatic Provides Answers

Here's ingenuity at work again.

This Simplimatic Automatic Lathe is making real savings in the machining of these 4½" rock bits for oil well drilling. Here's the story:

Loading—Initial alignment is very important. This is assured by a special loading fixture. The bit, complete with cutters, is loaded into the swinging air-operated cup fixture which holds it on the spindle centerline. An air-operated drawbar then pulls the loading fixture against locating stops. The chucking fixture is engaged and the piece is ready for machining.

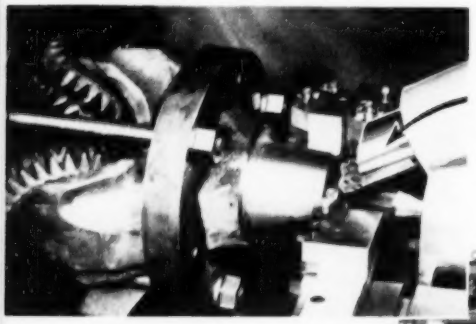
1st Stage—An angular slide moves in to center the bore. With this done, it retracts and the tailstock center comes in to support the shank for the heavy cuts to follow. All this is part of the completely automatic cycle.

2nd Stage—With the center in place, tools on the front slide taper turn the shank, which is made up of three welded sections. Tools on the rear slide chamfer and turn the face.

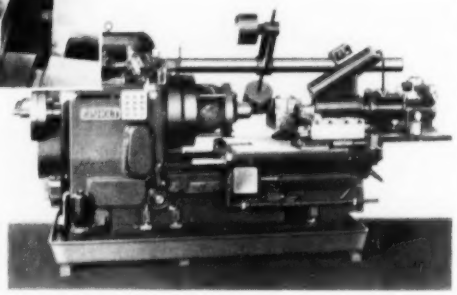
Remember, all this is done in a single automatic operation... and the time is only 2.25 minutes. Production-wise, this Simplimatic (which handles a number of different size bits) is producing at a rate equal to *three* hand-operated turret lathes.

The machining of these parts is reduced to a one-chucking job by the addition of a special tool slide for centering the workpiece.

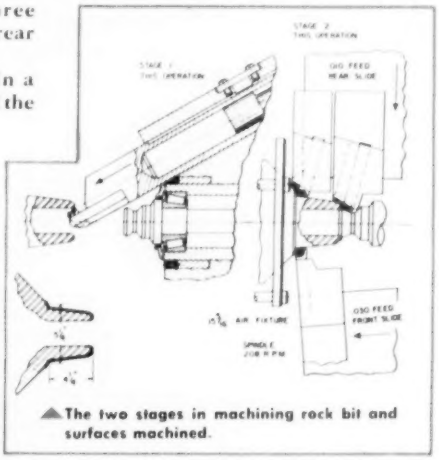
This is just one of 31 interesting jobs shown in the all-new Simplimatic catalog. Write for your copy today.



▲ Close-up of tool slide extended to cut center in bit shank. Slide then retracts and tailstock comes in to support the shank.



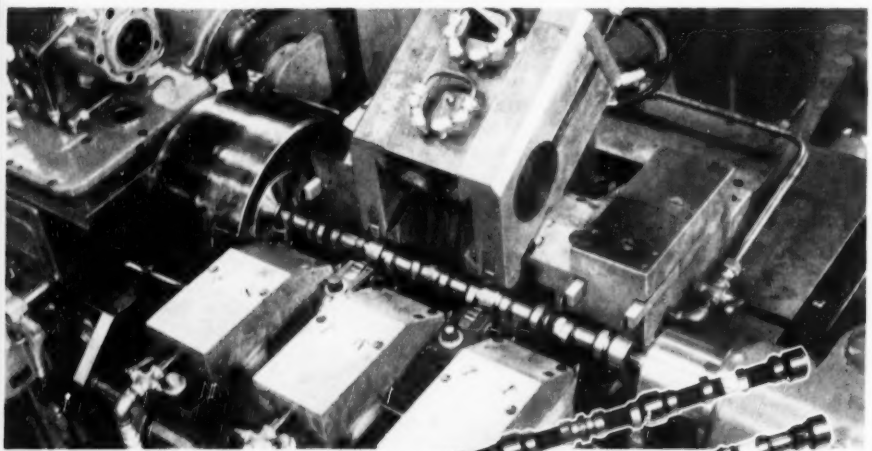
▶ Simplimatic with special tailstock tool slide and swinging fixture for loading and unloading.



▲ The two stages in machining rock bit and surfaces machined.

CAMSHAFTS GET QUICK CLEANUP IN THIS HIGH-PRODUCTION SETUP

Uses No. 12 Hydraulic Automatic Lathe



Tool setup for camshaft cleanup work. Note top and bottom supports. ▲

▲ Camshaft before cleanup: bottom camshaft after machining.

This job, cleanup operations on a six-cylinder camshaft, shows the kind of top speed, highly efficient setup demanded by the automotive industry.

A driver and center hold the forging. To give the long, thin camshafts the support required to prevent distortion and whip, there are two sets of intermediate rollers. The top rollers move in automatically before the cut is started and retract for unloading.

Slides and carriages are tied together in pairs to handle the entire length of the camshaft. The six diameters of the camshaft are turned by tools at the front. Form tools at the rear then plunge cut and clean up. Time per camshaft is 0.4 minute.

The fully automatic cycle of the No. 12 Hydraulic Lathe simplifies and speeds cleanup work on these automotive camshafts.

GISHOLT

TIME-SAVING IDEAS

WHERE C/F TURRET LATHE REALLY PAYS OFF

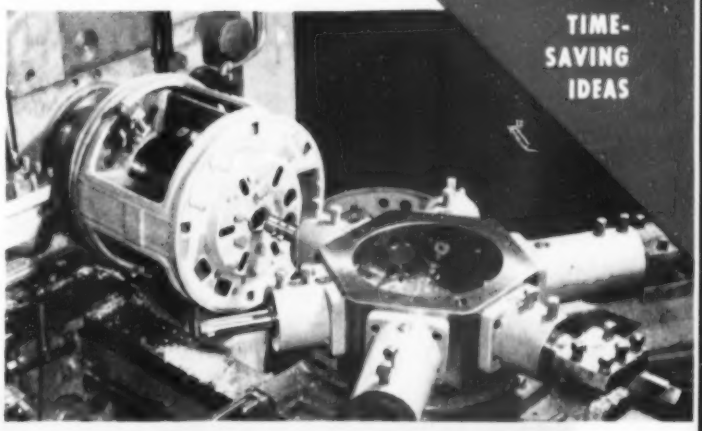
Inside Work Done with Ease

The two problems faced in the machining of these housings were (1) holding of the thin wall part and, (2) back facing the center bore. A special face plate fixture with draw-back clamps provided the careful chucking answer.

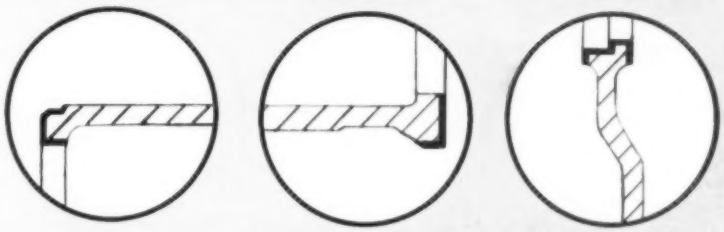
As for machining, the job might well have involved several operations with special tooling. However, the 2L Saddle Type Turret Lathe with its cross-feeding turret solved this problem. With the sliding hexagon turret, simple standard tools handle a number of different surfaces, including the back face and counterbore shown at the right in the drawing. Moreover, by doing the job in one chucking, concentricity is assured on the many different diameters.

With the cross-feeding turret, you can feed both laterally and longitudinally. Thus you can use simple tooling and can quickly change over to other types of work.

Simple tooling, plus the cross-feeding turret of this Saddle Type Lathe, add up to big savings on this interesting job.



Simple setup for machining awkward, thin-wall part.



Operations, including back facing, performed on this job.

GOOD TURRET LATHE SETUP FOR SMALL BRASS PARTS

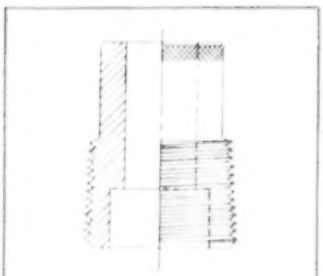
Ram Type Lathe Handles Parts in 5 Sizes

Here's a business-like setup for machining cast-brass plug bodies on a No. 3 Ram Type Turret Lathe. Held on the inside hex diameter by special jaws on an aluminum chuck, a combination turning, boring and facing tool on the first station does the bulk of the work.

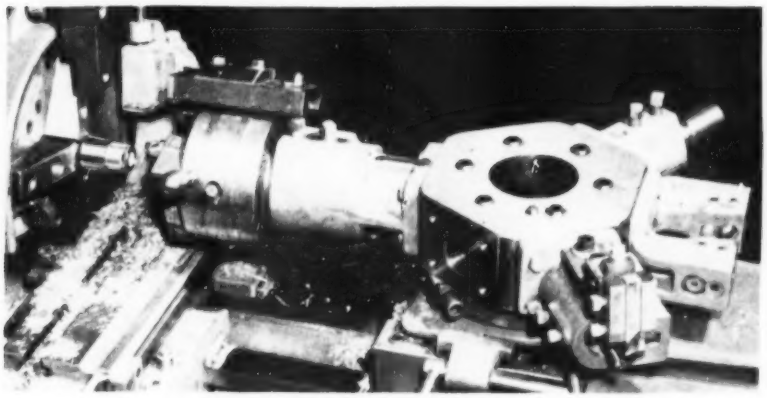
Knurling follows at the next station with the required rough finish put on 450 f.p.m. The third station is merely a revolving center which supports the end while a shave tool on the rear of the cross slide forms the taper O.D. At the last station, the taper is threaded by a special self-opening die head.

On a test run, this plug was machined in 0.84 minute, floor-to-floor. In addition, four other sizes, ranging from $1\frac{5}{8}$" to $2\frac{3}{16}$" O.D. are handled.

This user is time ahead by a fine job of tooling and a fast ram type lathe.



Work performed on the small plug bodies.



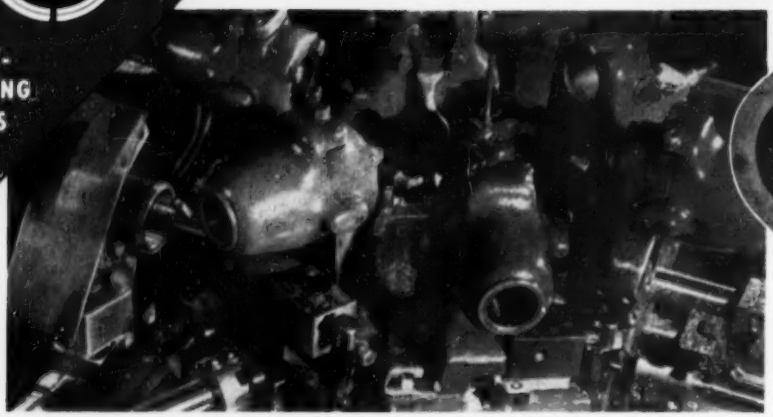
Before and after view of cast-brass plug body.

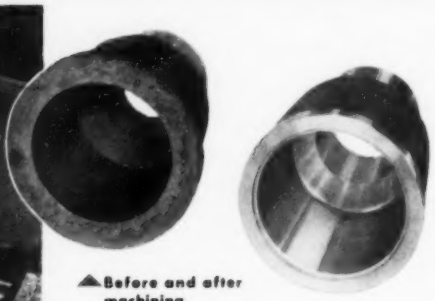
Final operation on the cast plug body is threading the taper.

GISHOLT

TIME-SAVING IDEAS

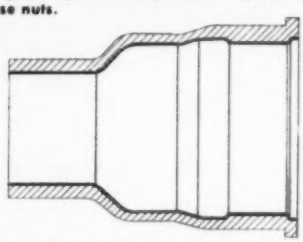
JOB SWITCHED TO FASTERMATIC— *PRODUCTION DOUBLED*





▲ Before and after machining.

◀ Simple setup for first operation on propeller nose nuts.



Heavy lines show surfaces machined by Fastermatic.

Complicated Form Machined with Ease

There was a 140% speedup in first-operation machining of these propeller nose nuts when the job went to the Fastermatic Automatic Turret Lathe. Time now is 5.0 minutes as against 12 minutes on a hand-operated machine.

The drawing shows the many surfaces to be handled. Working at five separate feeds, conventional tools rough and finish bore, turn and face. Doing the taper bore is a simple matter with the help of a turret facing attachment guided by a cam bar on the rear independent slide. A necking tool operated by an overhead stop bar does the recess in the bore.

Other advantages of the Fastermatic for this job are that no further finishing is required and its repeat accuracy has virtually eliminated spoilage.

Using standard tools, and in a continuous automatic cycle, this Fastermatic cuts tool costs and machining time in first operation work on these parts.

Good News on Deliveries! Production has been stepped up again on 1F and 2F Fastermatics. Check your requirements with your Gisholt representative now.

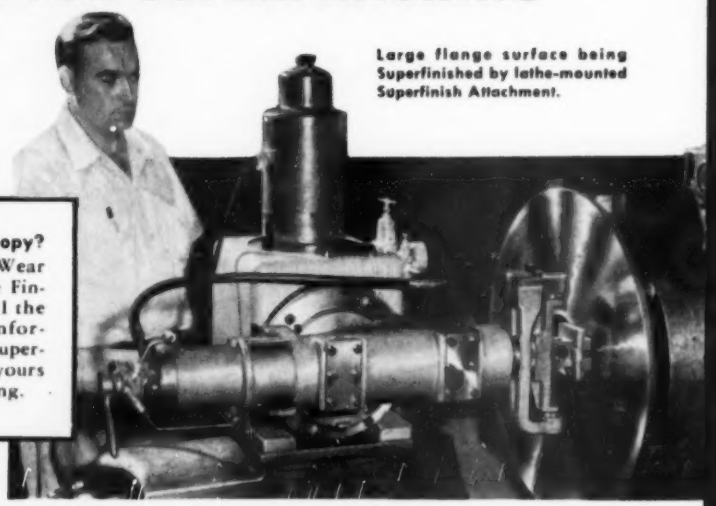
COST-SAVING IDEA FOR SUPERFINISHING

Mounts on Lathe to Provide Better Surfaces at Lower Cost

This beam flange for textile equipment is a far better product since Superfinishing has a part in its making. Yet, the investment in Superfinishing equipment is surprisingly low...the manufacturer simply mounted a Superfinish Attachment on the tool post of his engine lathe.

Formerly, the flange face was turned and then ground. Now, grinding has been eliminated and Superfinishing gives him a far better surface...in less time and at lower cost.

With a lathe-mounted Superfinish Attachment, this user is gaining important savings in grinding time while getting better, smoother, longer wearing surfaces.



Large flange surface being Superfinished by lathe-mounted Superfinish Attachment.

Have your copy? The book, "Wear and Surface Finish" has all the facts and information on Superfinish. It's yours for the asking.

No. 1-253

604

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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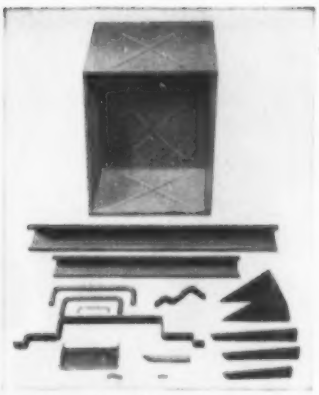
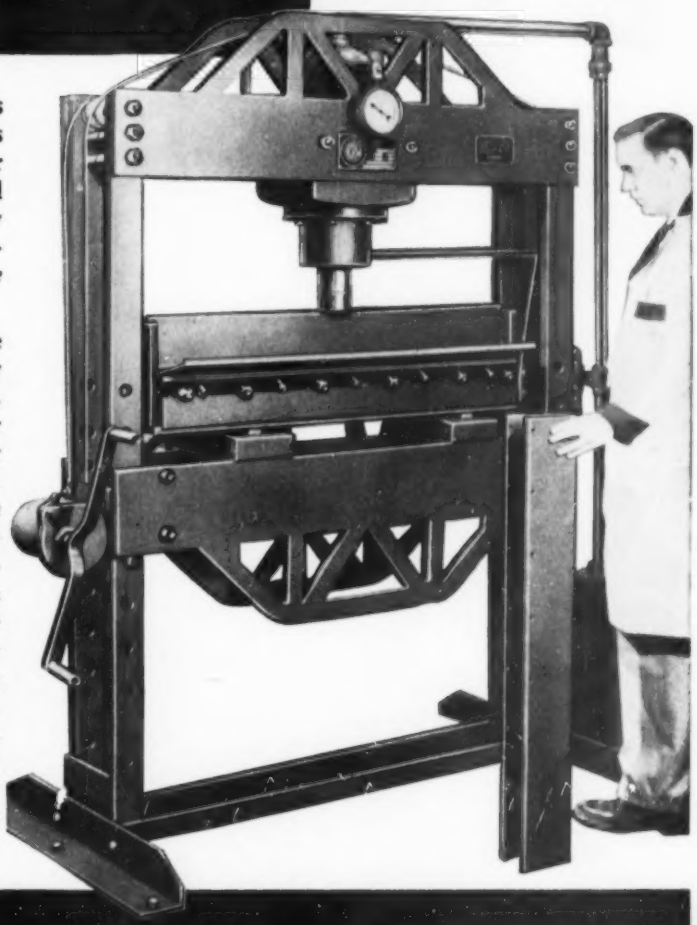


Here's the line-up . . .

Gross Machinery Inc. of Buffalo, N. Y., makers of dry cleaning equipment, forms all these parts on their KRW Hydraulic press. Each one used to be a slow, inaccurate hand or power brake job.

Gross Machinery originally bought this 75 ton KRW motor driven hydraulic press to form cylinder ribs of 14 gauge steel for their dry cleaning tumblers (second and third from top in photo above). Formerly made by hand, each rib required 12 minutes to form. Now the press does the *same job in* 1½ *minutes.*

But that was only the beginning. The press soon began poking its nose into every problem in the plant. It gave them a 50% increase in production of filter plates for their tumblers. The lint-collecting drawer (at top in photo above) used to rattle. Gross had almost decided to make these drawers out of heavier gauge, more expensive steel. But then they found that criss-cross ribs formed by their KRW press eliminated the trouble. Brackets for the tumblers, corner inserts for the tumbler hoods, clips for holding wire and tubing on the tumbler — all these jobs are now made faster, more accurately on this versatile KRW press. Earl Westphal, general production superintendent at Gross, says: *"We bought this press late in* 1950 *and it's paid for itself ten times over."*



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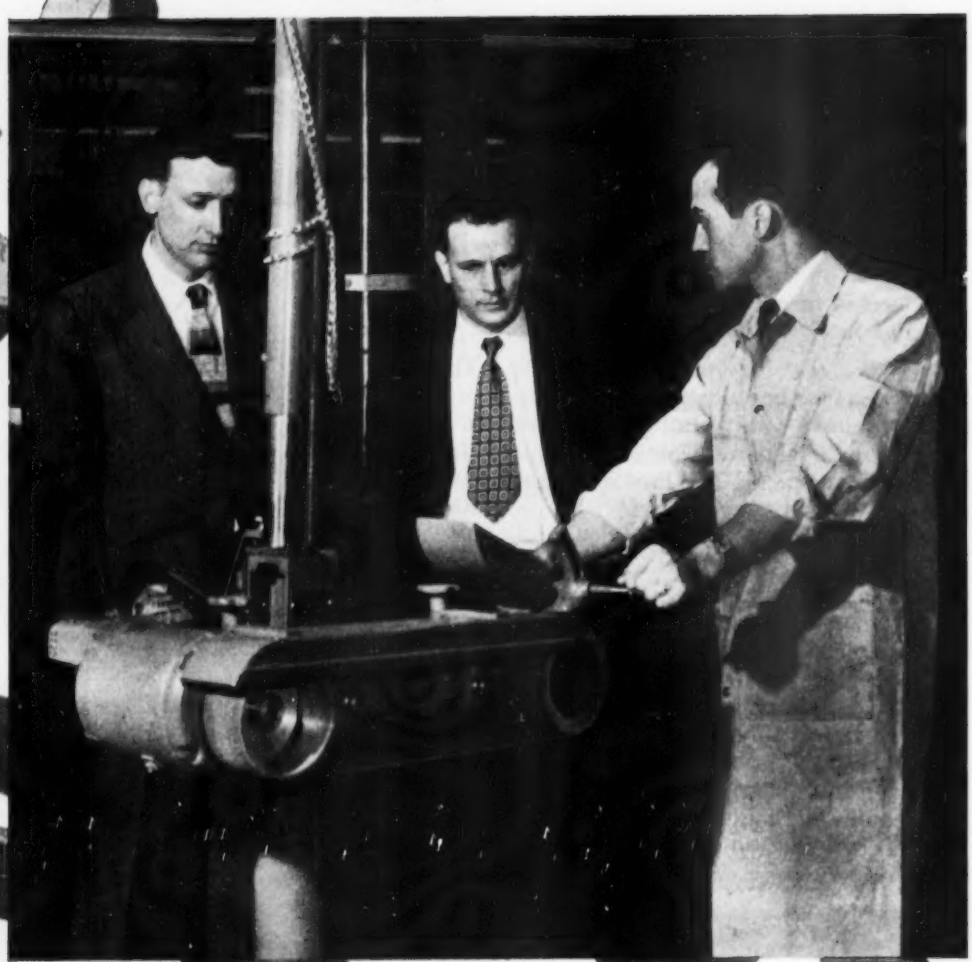

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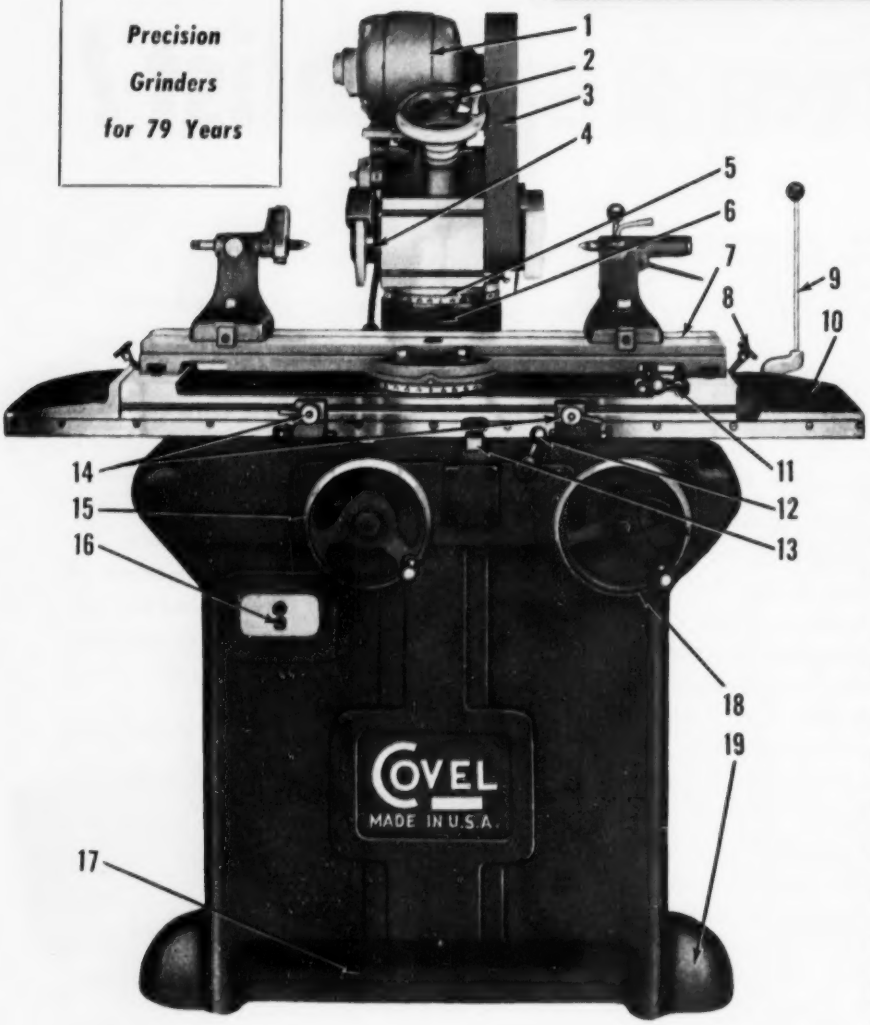

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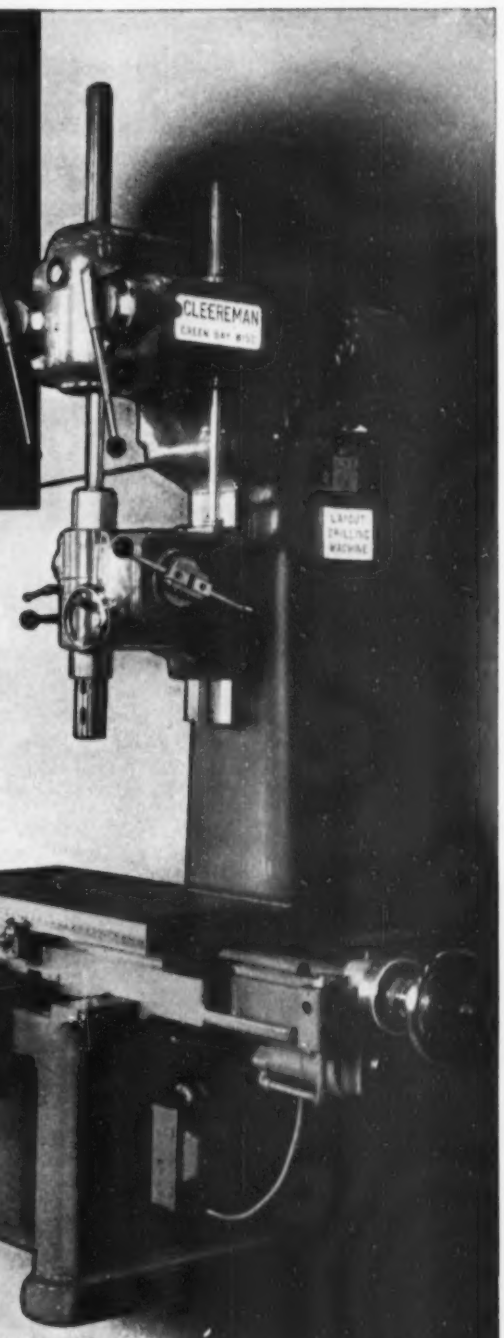

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1 NATCO TWO-WAY DRILLER made up of two HOLEUNITS

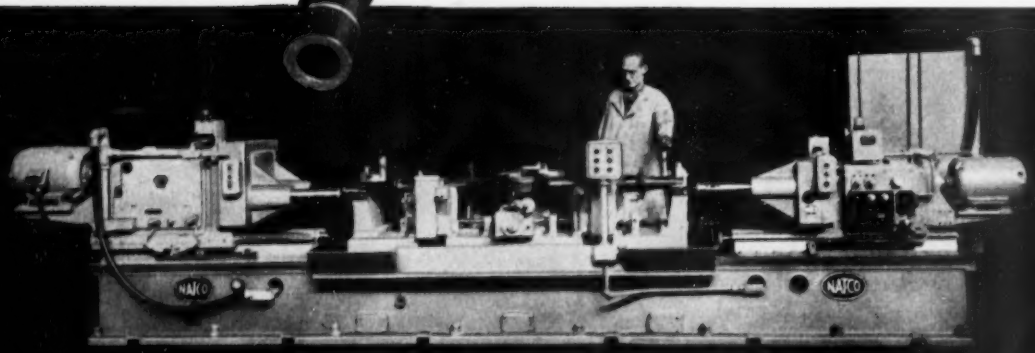
R. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole for tapered hole (approximately 1/32" smaller than small end of taper)

L. H. HEAD Drill one hole with multi-diameter tool to remove as much stock for taper as possible.

PART: Axle Housing

PRODUCTION: 30 parts per hour



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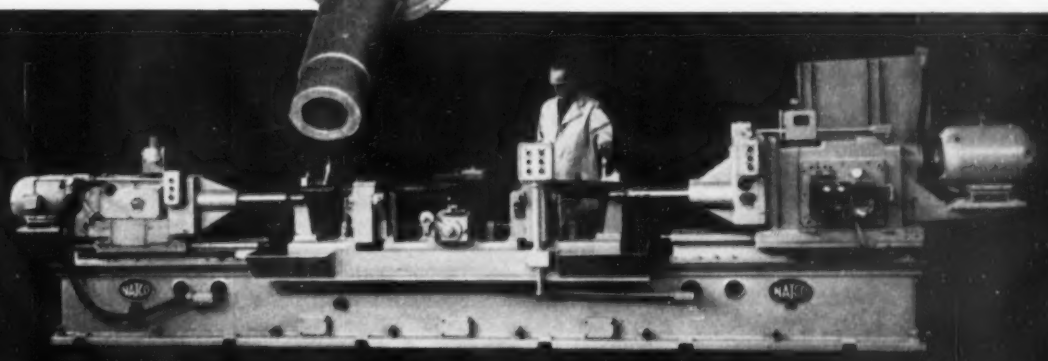
L. H. HEAD Combination counterbore and face boss on one hole 1⅛" diameter counterbore

R. H. HEAD Combination counterbore and face boss on two holes 1⅛" diameter counterbore.

R. H. HEAD

PART: Same axle housing after first NATCO machine completes drilling.

PRODUCTION: 45 parts per hour



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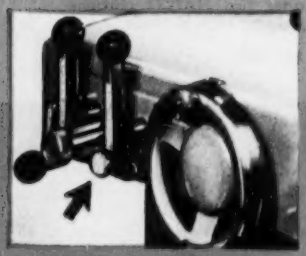
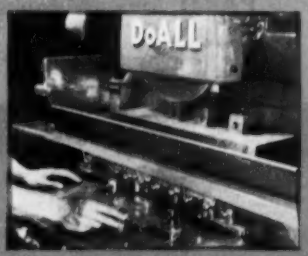
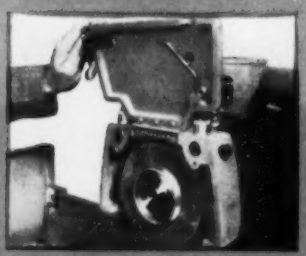


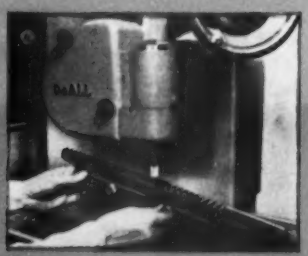
Variable speed wheel dressing feed.



Skip feed for intermittent plunge grinding.



New flood and "Cool-Grinding" system.

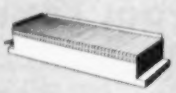


High speed spindle, vertical or horizontal.

ATTACHMENTS and ACCESSORIES

1. **Coolant System** —"Cool-Grind" (coolant through the wheel) or flood grind, or both simultaneously.
2. **Coolants** for every job.
3. **New Laminated-top Magnetic Chuck.**
4. **Magnetic Sine Chuck**—for fast easy setups on single or compound angle work.
5. **Selectron**—for controlling magnetic chuck holding power—and demagnetizing.
6. **High Speed Spindle Attachment Vertical or Horizontal**—provides speeds up to 20,000 RPM, for use of very small wheels.
7. **Variable Spindle Drive**—electronic control provides infinitely variable speeds.
8. **Crush Dresser Spindle Drive**—slow-speed drive for wheel crushing.
9. **Crush Grinding Attachment**—provides steady table speeds down to 1" per minute—includes heavy duty spindle.
10. **Adjustable Crush Roll Idler Stand**—permits tilting of crush rolls.
11. **Motor-Driven Crush Roll**—for forming grinding wheel or crush rolls.
12. **Automatic Downfeed**—can be set to feed at each reversal, or alternate reversals of table.
13. **Automatic Skip Feed**—table travel speeds up between multiple work pieces when plunge grinding.

BAND MACHINES

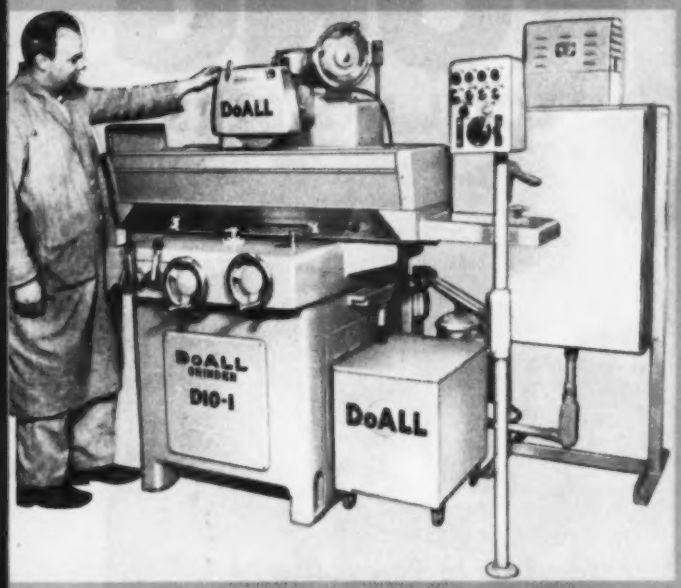


MAGNETIC CHUCK

SINE CHUCK

SELECTRON

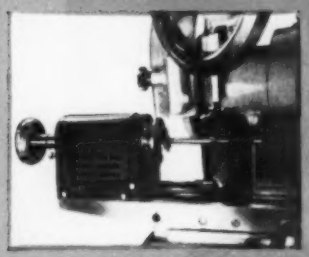
NEW LINE OF DoALL *Precision* SURFACE GRINDERS



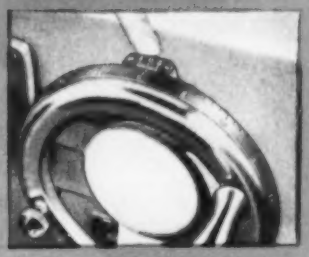
D-10 Models—10" x 30" chuck with 10" or 14" wheels.

- ★ *NEW* SIZES—including 6" x 24" and 10" x 30".
- ★ *NEW* 12½" WORK HEIGHT CAPACITY.
- ★ *NEW* SPEEDS—up to 100 fpm table travel.
- ★ *NEW* RECIRCULATING "COOL-GRINDING" SYSTEM.
- ★ *NEW* RIGIDITY AND STURDINESS.
- ★ *NEW* ATTACHMENTS AND ACCESSORIES.
- ★ *NEW* CONVENIENT CONTROLS.
- ★ *NEW* FULLY AUTOMATIC OPERATION.

...and more!



Cylindrical grinding and indexing attachment.



Slip rings for zeroing handwheels.

NEW DoALL Surface Grinders will handle an unlimited variety of surface grinding, cylindrical grinding and form grinding jobs with a heretofore unattainable combination of precision and speed.

You have to see them perform to visualize their capabilities. Ask to have a free demonstration in your own plant. Call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY
254 N. Laurel Ave. Des Plaines, Ill.

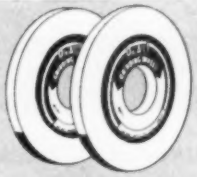
14. **Fully Automatic Surface Grinding**—controls cross-feed and downfeed automatically.
15. **Cylindrical Grinding Attachment**—for straight and taper cylindrical grinding and indexing.
16. **Dust Collector**—for all dry grinding operations.
17. **Wheel Dressing Diamonds and Holders.**
18. **Universal Vise**—completely adjustable for holding work in any position.
19. **Set of Plain Centers.**
20. **Wheel Balancing Stand and Arbors.**
21. **Grinding Wheels.**
22. **Complete Electrical Panel Remote Control Systems.**

DoALL

NEW CATALOG

Free. Complete data and description of DoALL Grinder design and construction—coolant systems—controls—automatic setups—attachments. Ask for your copy.

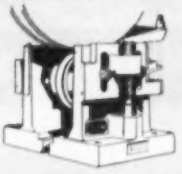
COOLANTS



GRINDING WHEELS

DIAMOND DRESSER

DUST COLLECTOR



CRUSH ROLLS

GAGE BLOCKS

ARMSTRONG
TOOL HOLDERS

Equip with
ARMSTRONG TOOL HOLDERS
for Defense production

A change over to new products, starts in the tool room and the die shop . . . starts with ARMSTRONG TOOL HOLDERS. In preparing for defense orders, the logical first step is to check your stock of ARMSTRONG TOOL HOLDERS. With the correct types for every operation, and the correct sizes for each lathe, planer, slotter and shaper, you will be able to start work on a moments notice.

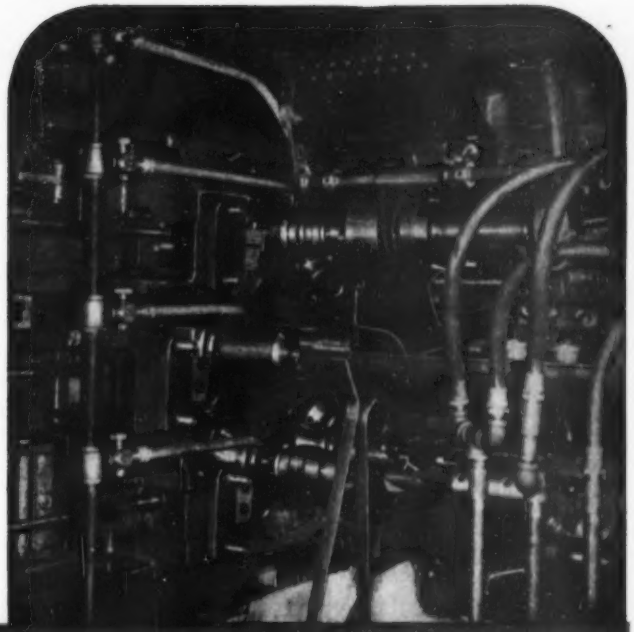
ARMSTRONG TOOL HOLDERS reduce "tooling-up" to the selection of a cutter and tightening of a set screw. They permit operation at higher speeds, and heavier feeds than are customary—they enable you to produce more pieces per hour, per man, per machine.

Produced by modern methods, in a specially-built tool plant, they are the lowest cost tooling you can buy. And, they are as available as your telephone for they are carried in stock by your local supply house.

Use ARMSTRONG TOOL HOLDERS wherever possible for lower tool cost, saving in High Speed Steel, increased output and greater profit. *Write for Catalog*

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30 ILL.

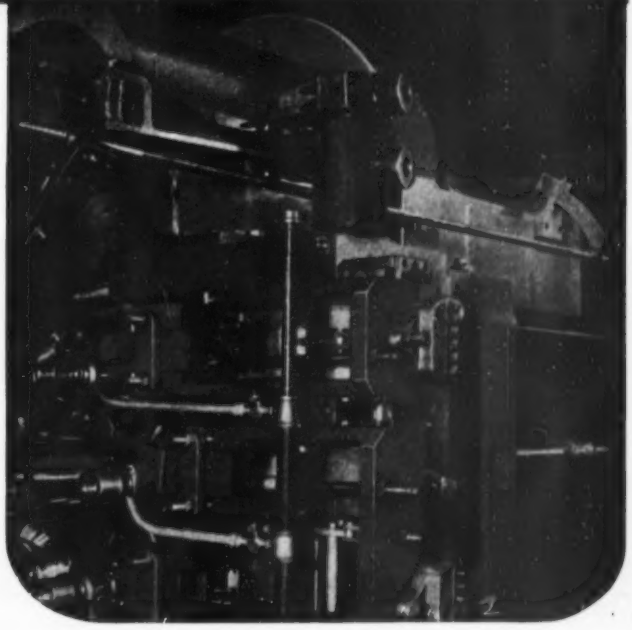
The main end slide of a 3½-SIX figures prominently in producing the above piece. Its total length is 34½ ins. Its diameter is 12 ins. Its swing for die heads, etc., is 4 ins. The maximum recommended load for the slide is 12,000 foot pounds. Its bearing area is approx. 258 sq. ins.



Front Side of Tooling Area

BETTER BEFORE THAN AFTER

Rear Side of Tooling Area



What an "automatic" does *after* it goes into production is information for which you have already paid a purchase price. How much more you will pay for operation and maintenance costs will determine the completeness and dependability of that information.

It is always better to have complete and dependable information *before* the purchase than after. You can have it on CONOMATICS.

A Comparison of ALL Automatics is in favor of Cone

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

automatic performance reduces costs

even on **SHORT RUN** *jobs like this*

A MOTOR MANUFACTURER who made this commutator sleeve, and similar components, in lots of 300 to 800 and in several sizes, said *"on a modern type, hand-operated turret lathe our net output varied from 2½ to 3 pieces per hour, depending upon conditions".*

Present output on his new Acme-Gridley Model M Single Spindle Automatic has more than doubled, as the job facts reveal. Much of this increase is due to Model M design features which avoid those so-called "conditions". Most important among these features is. . .

—fully automatic performance which guarantees a controlled cycle time and uniform precision—piece after piece

In other shops, these newest Acme-Gridley Single Spindle Bar Automatics, on hundreds of small and large lot jobs, are *2 to 10 times faster than the machines they replaced.* Ask for Catalog M-50A—better still, ask us to quote.

JOB FACTS:

Part: Commutator Sleeve
Size: 3⅜" dia. 2¾" long
Material: C-1030 Steel
Machine Time: on Acme-Gridley 3½" Model M Single Spindle Automatic—10½ minutes.
Operations: 11, including rough and finish trepan on O.D. of flange for smooth finish, reaming hole for close concentricity and threading with automatic Vers-o-tool to class 3 fit.
Former Time: on current model hand operated turret lathe—20 to 25 minutes.

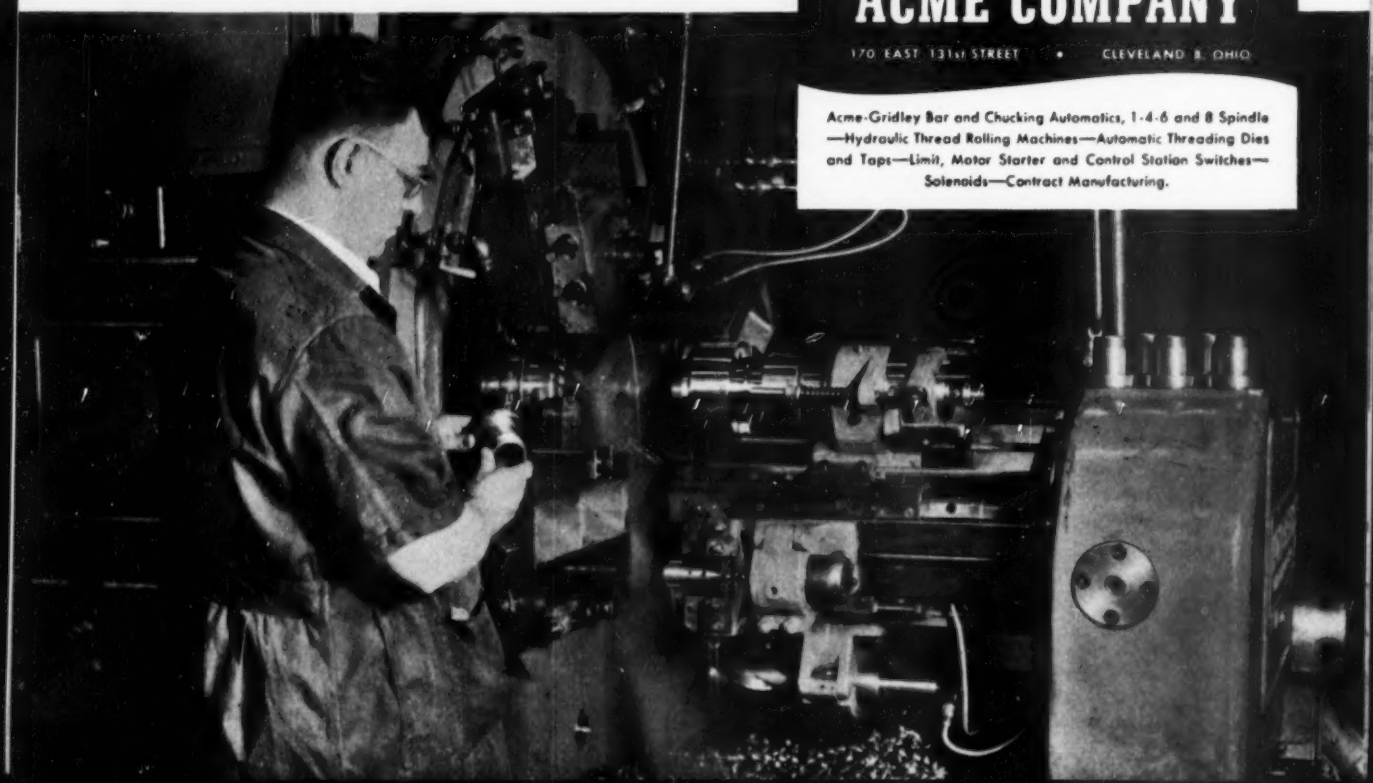
Other Model M time and cost reducing advantages are—

- Eight independently operated tool slides and three automatic spindle speed ranges selective to suit each cut, whether for use of carbide or high speed tools.
- Turret indexes in 1 second and its independent tool slides provide for overlapping operations such as several short end cuts while the heavy cuts are continued from the side slides.
- The Model M also features standard cams, interchangeable spindle speed and feed change gears, and wide open tooling zone—all quickly accessible. So the set up time for changing jobs to secure fully automatic performance on similar work does not exceed that of the hand operated lathe.

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.



COMMISSAR
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IS LOOKING AT GLORIOUS HERO INSTEAD OF CLOCK
ALL WORK AND NO PLAY IS WINNING MEDAL (EXCEPT HERO)
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"Is new American cost-cutting weapon... Pure Oil Industrial Lubricants"

Pure Oil specializes in top-quality industrial oils and greases designed to do several *different* jobs—instead of one specific job.

And to do each job *equally well.*

Regardless of the type of machinery you have in your plant, our industrial engineers can nearly always help you to reduce your lubricants inventory . . . simplify your lubricating procedure . . . minimize waste and error.

Mail coupon today for free "Simplify and Save" booklet giving full details on how to start a labor-saving, money-saving, lubrication program in your plant.

Hundreds of machines . . . only one grease!

A large midwestern metal-working plant produces chrome-plated trim (hub caps, grills, etc.) for the automotive industry. All types of metal-working equipment—400-ton presses, shears, drills, lathes, roller-levelers and grinders—are used as well as huge chrome-plating machines. Yet *only one grease*—Pure Oil's POCO HT GREASE B—and one dispenser is used for *all* applications! And in 3 years there has been no down time due to lubrication failures.

THE PURE OIL COMPANY, U.S.A.

PURE

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35 East Wacker Drive, Chicago 1, Illinois

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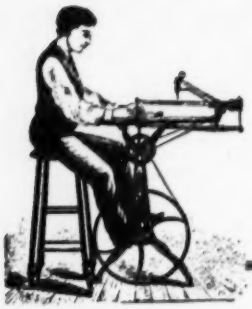
80 YEARS OF PROGRESS

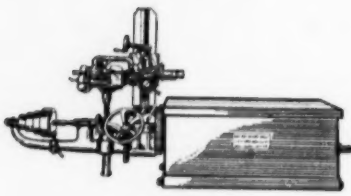
at W. F. & JOHN BARNES



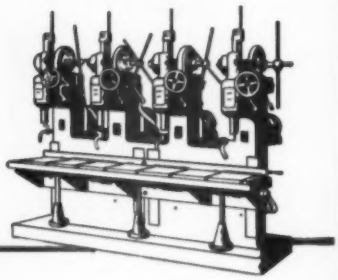
Presented here are a few of the milestones in machine tool building which, over the years, have helped industries achieve the goal of producing more and more goods for more and more people at a lower cost. In effect, the application of these early Barnes Machines trace the technological advancement in machining methods. With this background, we are today better able to serve your current and future needs.

1872 Foot-Powered Scroll Saw — the first Barnes-built industrial machine.

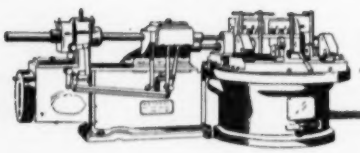
1885 Open Frame Single Spindle Drill Press — belt-driven and hand feed.



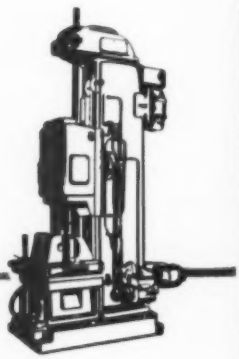
1900 Barnes Horizontal Radial Drill — used for automobile crankcase drilling and boring work.



1920 Single Purpose 20" Barnes Production Gang Driller.



1925 Barnes Single Head Screw Feed Boring Machine — equipped with rotating table.



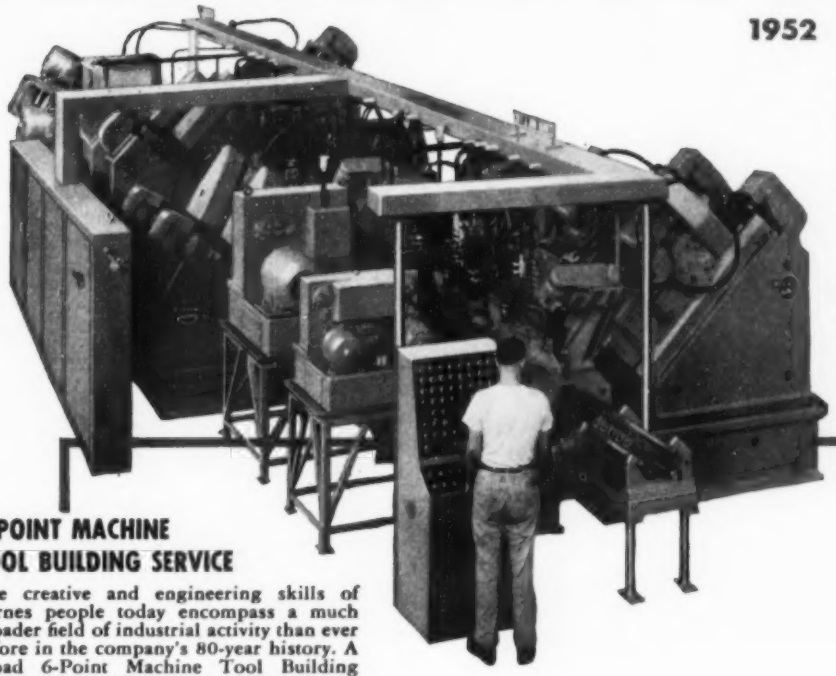
1930 Barnes Special Vertical Single Point Boring and Reaming Machine — equipped with hydraulic feed unit.

W. F. & JOHN BARNES

W. F. & JOHN BARNES COMPANY

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

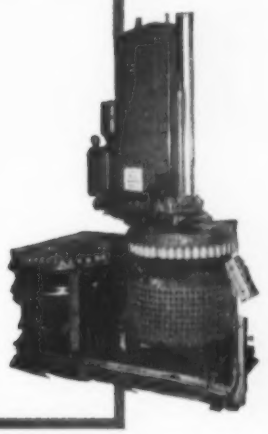
in Machine Tool Building



1952

One of the latest Barnes Automatic 13-Station Progress-Thru Machines for drilling, reaming, chamfering and tapping V-8 automobile engine cylinder heads. Machine is equipped with 82 spindles and handles 78 machining operations at a gross production rate of 125 pieces per hour.

(Below) An Automatic Retort Loading Machine is one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers and special conveyors designed and currently built at Barnes for food, chemical and beverage industries.



6-POINT MACHINE TOOL BUILDING SERVICE

The creative and engineering skills of Barnes people today encompass a much broader field of industrial activity than ever before in the company's 80-year history. A broad 6-Point Machine Tool Building Service is provided by experienced mechanical, hydraulic, electrical, process, tool and fixture engineers working together toward a common goal. As a result, you get the benefit of a coordinated effort that saves time and trouble.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES . . .

1. **SPECIALIZED MANUFACTURING FACILITIES**—80 year background, large well equipped plant efficiently tooled to produce high production machines.
2. **SPECIAL HYDRAULIC EQUIPMENT**—designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
3. **SPECIAL GAUGES, FIXTURES, TOOLS**—designed for each individual machining problem, assure accuracy of operation at high production speeds.
4. **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS**—individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.
5. **SPECIAL HANDLING AND CONVEYOR EQUIPMENT**—designed and built to reduce work handling, effect maximum safety and efficiency.
6. **COORDINATED DESIGN AND ENGINEERING**—Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

Write for Free Data

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service. Illustrates and describes modern machines and mass production techniques.

314 S. WATER STREET, ROCKFORD, ILLINOIS

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.

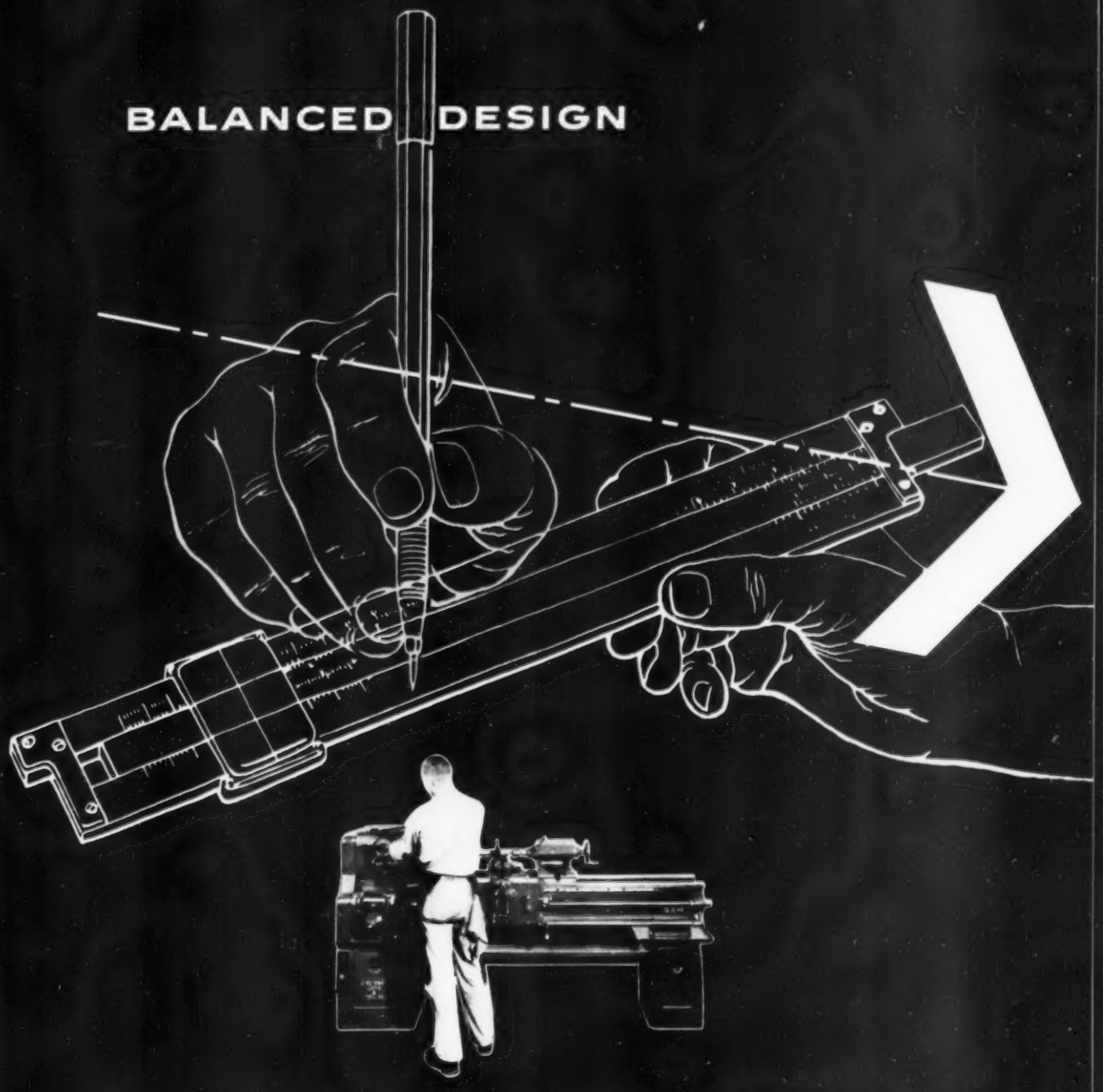
Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

BALANCED DESIGN



Tray-Top Cintilathes make friends of your customers by helping you deliver top quality work at less cost. Every pound of weight, every gear, shaft, bearing, every working component, every control — does its part to improve your products and lower your costs. If your business is competitive, compare the work you are getting from your present machines with the performance you can expect from Tray-Tops per dollar invested. Your Cintilathe dealer will gladly arrange a demonstration.

best buys in their class!

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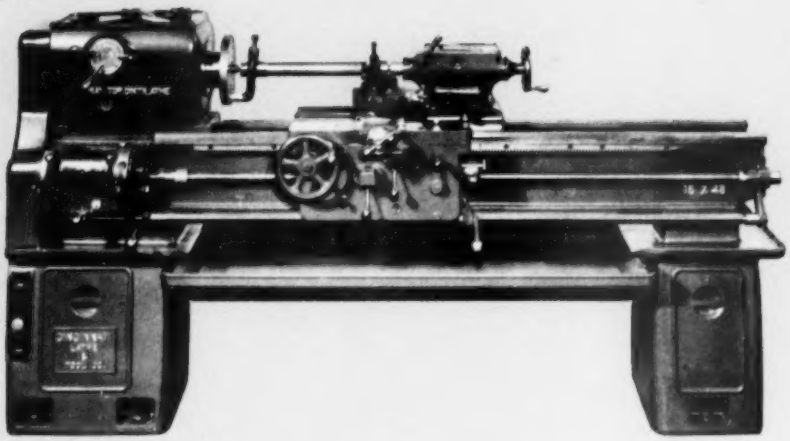
CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

MORE **QUALITY** FEATURES



WIDER WORK RANGE

MAXIMUM CONVENIENCE

SIMPLE INSTALLATION

EASY MAINTENANCE

SUSTAINED ACCURACY

ECONOMY PRICED

12 spindle speeds in geometric progression with an all geared transmission . . . Large spindle mounted in three precision anti-friction bearings . . . Direct-reading color-match speed shift . . . Double walled, one piece apron with automatic lubrication . . . Totally enclosed, automatically lubricated, quick-change gear box, incorporating leadscrew reverse . . . Flame hardened gears in headstock, quick change box, and apron . . . Ground bedways (flame hardened at extra cost).

CINTILATHES: The complete, balanced line,
Tray-Top for light duty (engine, toolroom and gap bed models),
10", 12½", 15", 18" sizes, 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes, 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

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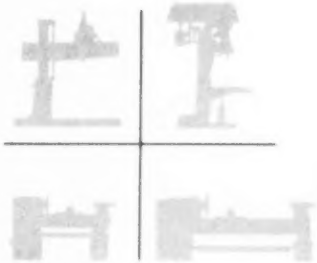

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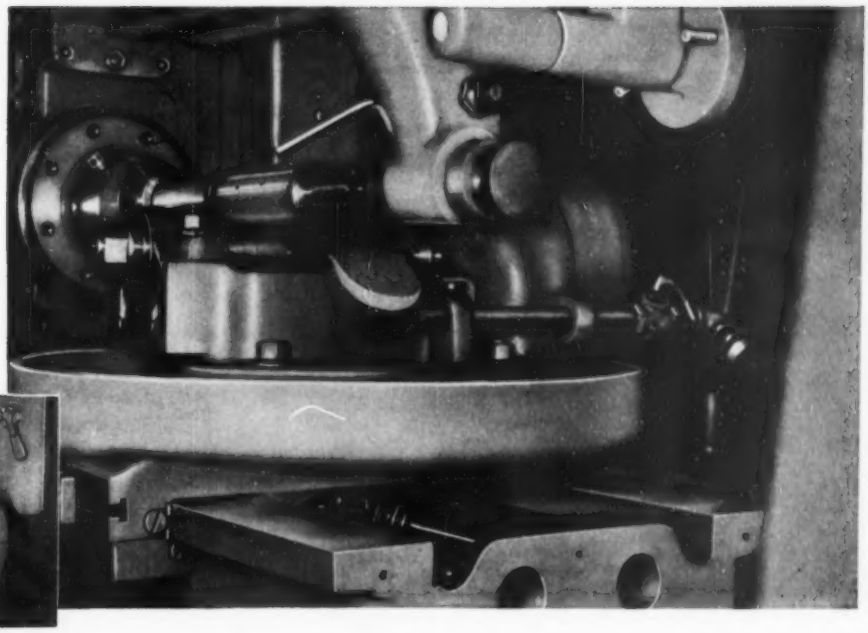

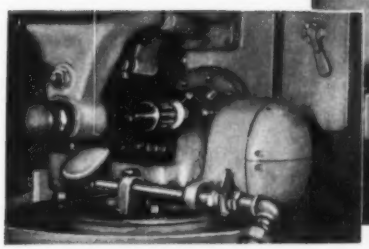

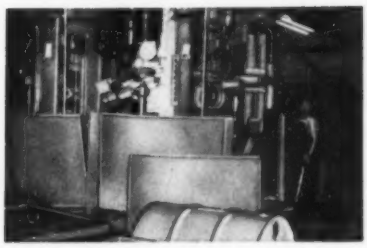

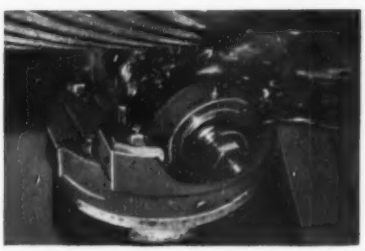

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at Timken-Detroit Axle Company

TOOL WEAR REDUCED 25%...MANUFACTURING COSTS ALSO CUT!

In an effort to reduce tool wear and cut manufacturing costs, the Wisconsin Division of Timken-Detroit Axle Company at Oshkosh called in Cities Service Engineers to make "on-the-job" tests.

Cities Service Lubrication Engineers made an on-the-spot study of the Timken-Detroit operation. This "on-the-job" evaluation by skilled Cities Service Engineers, long practiced in solving like problems, resulted in a recommendation for the use of a Chillo Cutting Oil that actually reduced tool wear 25% with proportionate savings in manufacturing costs!

WHAT ARE YOUR PROBLEMS? Why not take advantage of free, "on-the-job" testing? Call for our lubrication engineers at the office nearest you, or write Cities Service Oil Company, Dept. **B4,** Sixty Wall Tower, New York City 5, New York.

CITIES SERVICE

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JOBS LIKE THESE...

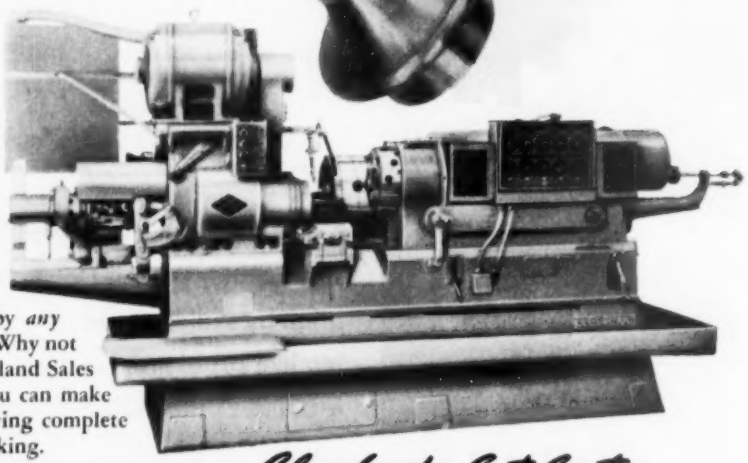
Made to order for CLEVELAND MODEL A AUTOMATICS

Produced without complicated tooling, the parts shown above are a few examples of *profiable* production turned out at high speeds on 3¾", 5¾" and 8" Cleveland Model A Single Spindle Automatics.

The Cleveland Model A combines an extremely wide range of multiple-tooled operations, with quick set-up and simplified control. The result is a machine tool that will handle your parts runs—in large and small quantities—with real economy.

On the 3¾" and 5¾" Model A Clevelands, job set-ups and machine operation have been even further simplified by the incorporation of Cleveland's exclusive *Electric Feed Drive.* Forward and return turret tool feeds are set simply by turning dials on the control panel.

Here is an automatic worthy of full investigation if you are now turning and forming duplicate parts up to 8" O.D. by *any* method—even full automatic production. Why not get a cost analysis from your nearest Cleveland Sales Engineer? See for yourself the savings you can make with the Cleveland Model A. Bulletins giving complete machine specifications are yours for the asking.



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A coalition of outstanding "name" products dedicated to the interests of industry.

Here is a "Caterpillar" Diesel DW20 Tractor with W20 Wagon loading heavy clay for the Garza-Little Elm Dam near Lewisville, Texas.

The astonishing ease of operation of these units due to their ultra-modern design makes the "load" lighter and the cost lower.

For the very same reason "Caterpillar" uses many "American" Radials. Because of their ultra-modern design they make the drilling, boring and tapping "load" lighter in "Caterpillar" plants and keep the cost of production at a minimum.

Extra power, centralized control, boring mill type spindle and extra fast tapping are outstanding virtues of "American" Hole Wizard Radials which swell the operator's pay envelope and help keep production on a profitable plane.

For more work, better work and lower cost work, get the facts about "AMERICAN".

Bulletin No. 327 upon request.

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WHETHER A HOLE IS DEEP OR SHALLOW, narrow or wide, whether it's difficult to get at, recessed or irregular, there's a Federal Indicator Gage to check it conveniently, and to precisely the dimension limits you require. We will gladly recommend the proper hole gage for your work.

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Checks Inside Inaccessible Dimensions that no other gage will reach. Legs shaped to suit requirements. Model 149 Series Caliper.

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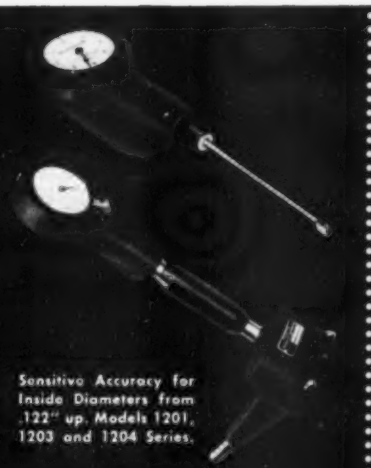
FEDERAL

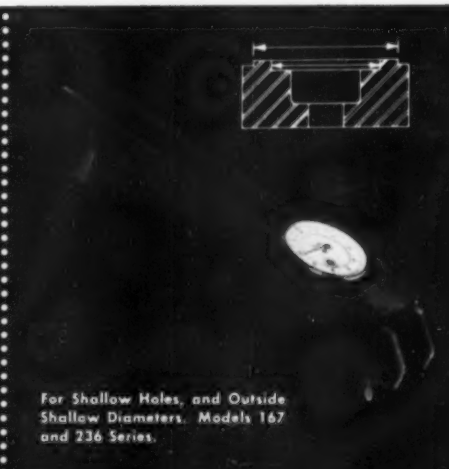
LARGEST MANUFACTURER DEVOTED EXCLUSIVELY TO DESIGNING AND MANUFACTURING ALL TYPES OF DIMENSIONAL INDICATING GAGES

the hole condition...

THERE'S A FEDERAL INDICATOR GAGE TO CHECK IT!



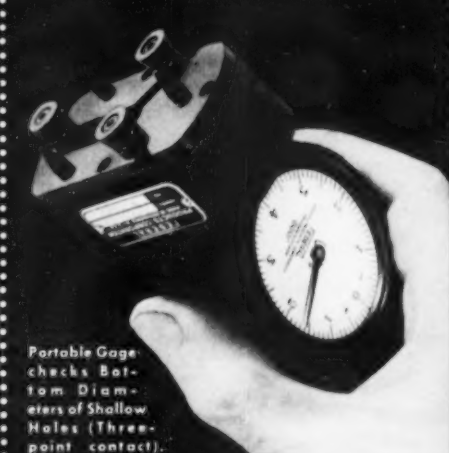
Sensitive Accuracy for Inside Diameters from .122" up. Models 1201, 1203 and 1204 Series.



For Shallow Holes, and Outside Shallow Diameters. Models 167 and 236 Series.

For Longer Ranges and for Holes having *larger* Inside Holes or Recesses. Models 1242 and 1243 Series.

Bench type for Inside or Outside Diameters (Two or three-point contact). Model 36 B-6 Comparator.



Portable Gage checks Bottom Diameters of Shallow Holes (Three-point contact). Model 36 P-18.

Plug type, locates Gage in Hole quickly. Inspects Small Holes from ¼" up. Model 165.

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Please send me information about the following:

☐ Sketch ☐ Blueprint is enclosed showing dimension we wish to gage.

☐ Model 1201, 3 & 4 Types	☐ Model 1242, Two-Point Type	☐ Model 36 B-6 Comparator
☐ Model 167 I.D. Type	☐ Model 1243, Three-Point Type	☐ Model 36 P-18 Portable
☐ Model 236 O.D. Type	☐ Model 149 Caliper Type	☐ Model 165 Plug Type

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MODEL NO. 32
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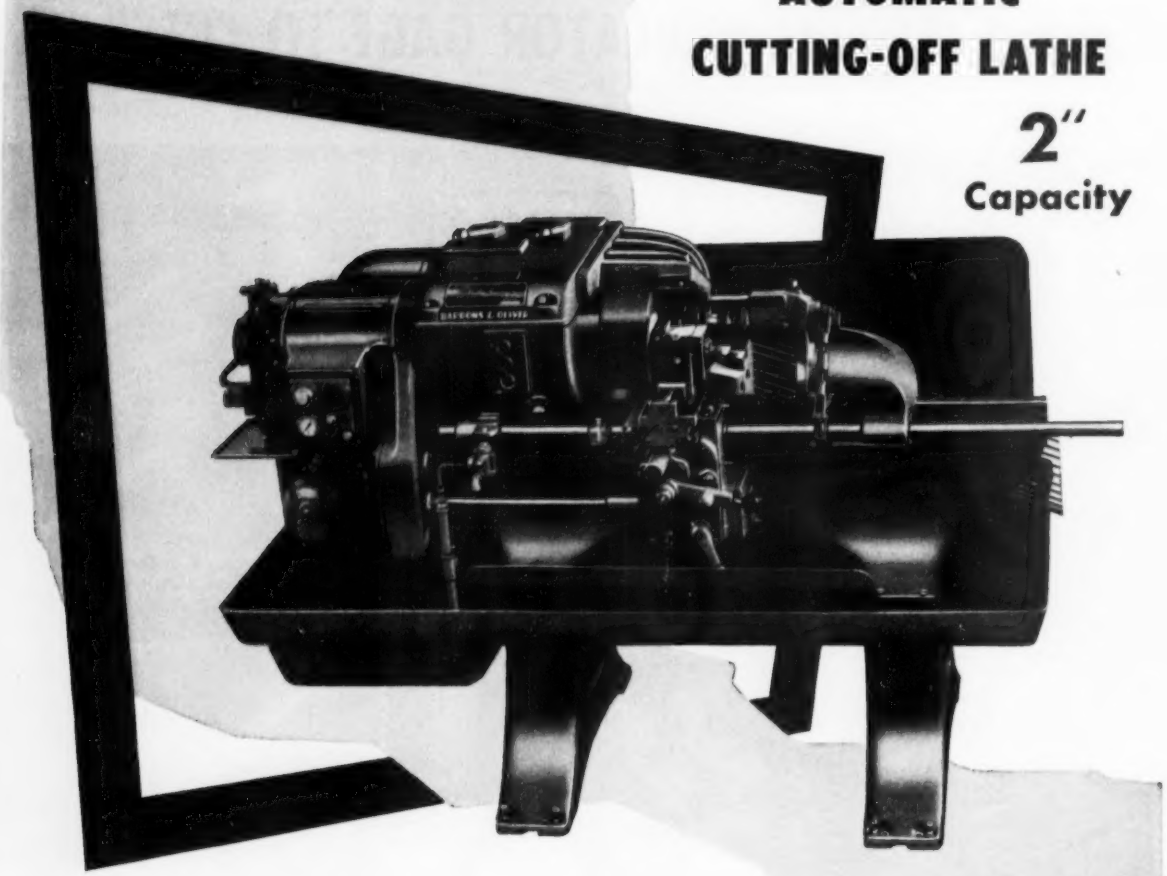
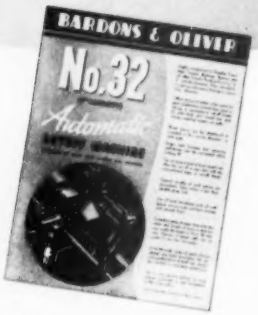


Increased Rigidity and Sturdiness of the entire tool feeding mechanism results in more continuous production and assures a longer, accurate life of the machine.

The machine is capable of over 100 cycles per minute . . . its production *AVERAGE* is 30,000 pieces in an 8 hour day. Highly productive for nipples, couplings, ferrules, bushings, spacers, and all other tubular products.



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Keep free of costly assembly headaches with small gears by . .

Assembly lines run smoother, with greater speed and efficiency, when your Small Gearing is made by G.S. It is consistent *uniformity* that turns the trick! Over 35 years of specialization has taught us to mass-produce Fractional Horsepower Gearing to standards of quality often considered impossible! If you want production quantities of Small Gears that soothe assembly headaches, *let G.S. make them for you!* More and more critical buyers are profiting by the superior skills and services only G.S. can give. Call us early when new designs are considered. We'll try to point the way toward new production speed and economies.

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!

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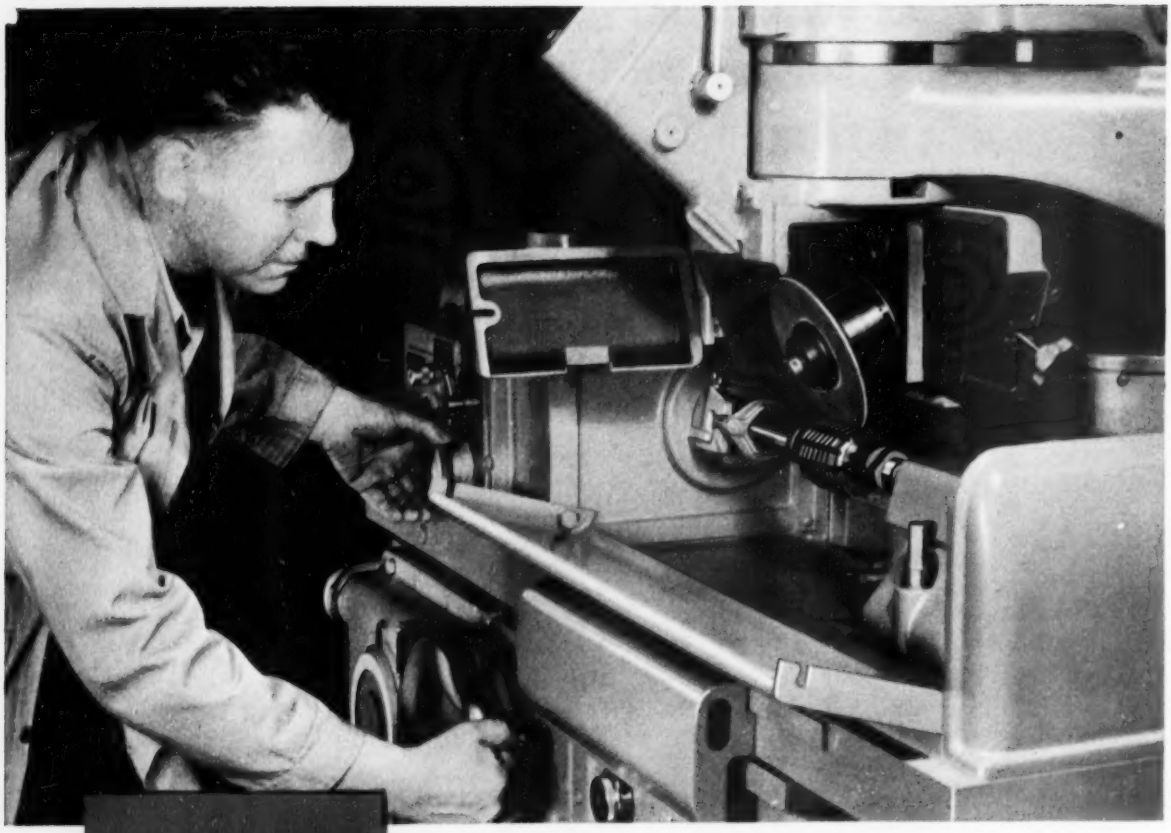
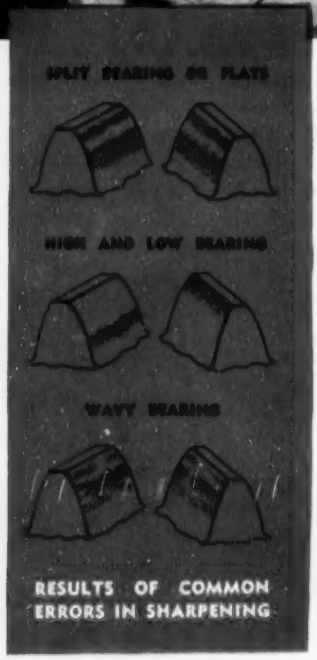




Proper Hob Sharpening

IS ESSENTIAL FOR ACCURATE ECONOMICAL GEAR PRODUCTION

The accuracy for which you pay in your hobs, machines, blanks, tooling and labor — is lost immediately when incorrectly sharpened hobs are used to cut gears.

Without precision control of your sharpening, the lead and tooth profile may lose their original accuracy. This loss of accuracy produces faulty, noisy gears, rejects, increased inspection time, and unnecessary non-productive machine time.

To maintain top accuracy and efficient, economical gear production, it is essential to have correctly sharpened hobs. Barber-Colman Sharpening Machines offer positive mechanical control over sharpening elements. These machines provide the means for sharpening hobs to their original tolerances.

B U I L D E R S O F P R E C I S I O N G E A R

SAVES TOOL COSTS

When properly sharpened, your hobs cut more pieces between sharpenings, and less stock is removed per sharpening, resulting in an overall increase in hob life. Using Barber-Colman positive mechanical control, all teeth are uniformly sharpened to original tool accuracy.

SAVES INSPECTION TIME

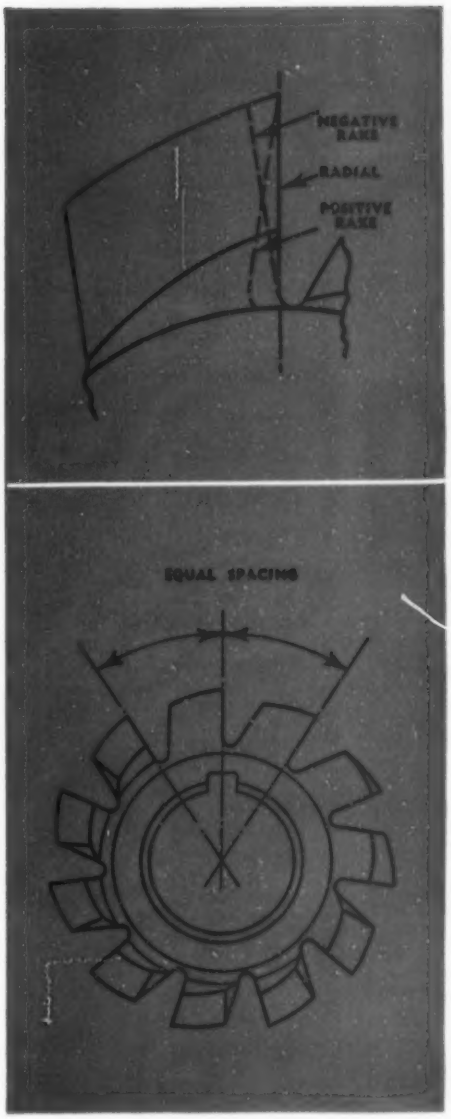
Correctly sharpened tools eliminate cut and try methods on the hobbing machine. Repeated inspections while setting up a job can be reduced considerably by reproducing the original accuracy of the hob. Correctly sharpened tools reduce finished inspection time to a minimum.

SAVES PRODUCTION TIME

Long wearing, accurately cutting hobs reduce machine stoppages to a minimum. Duplication of accuracy and form is consistent, promoting a smooth flow of production pieces. With this dependable cutting efficiency, the number of pieces per hob sharpening can be accurately determined, allowing the tools to be changed at the most conveneint time. Loss of machine output due to frequent hob changing is avoided.

SHARPENING SERVICE

Barber-Colman offers a complete sharpening service to all hob users. Features such as radialism or rake offset, high helix angles, and flute spacing are sharpened easily with Barber-Colman positive mechanical control. A Barber-Colman Field Engineer will consult with you on your special problems. Take advantage of this complete service and ask for recommendations today.



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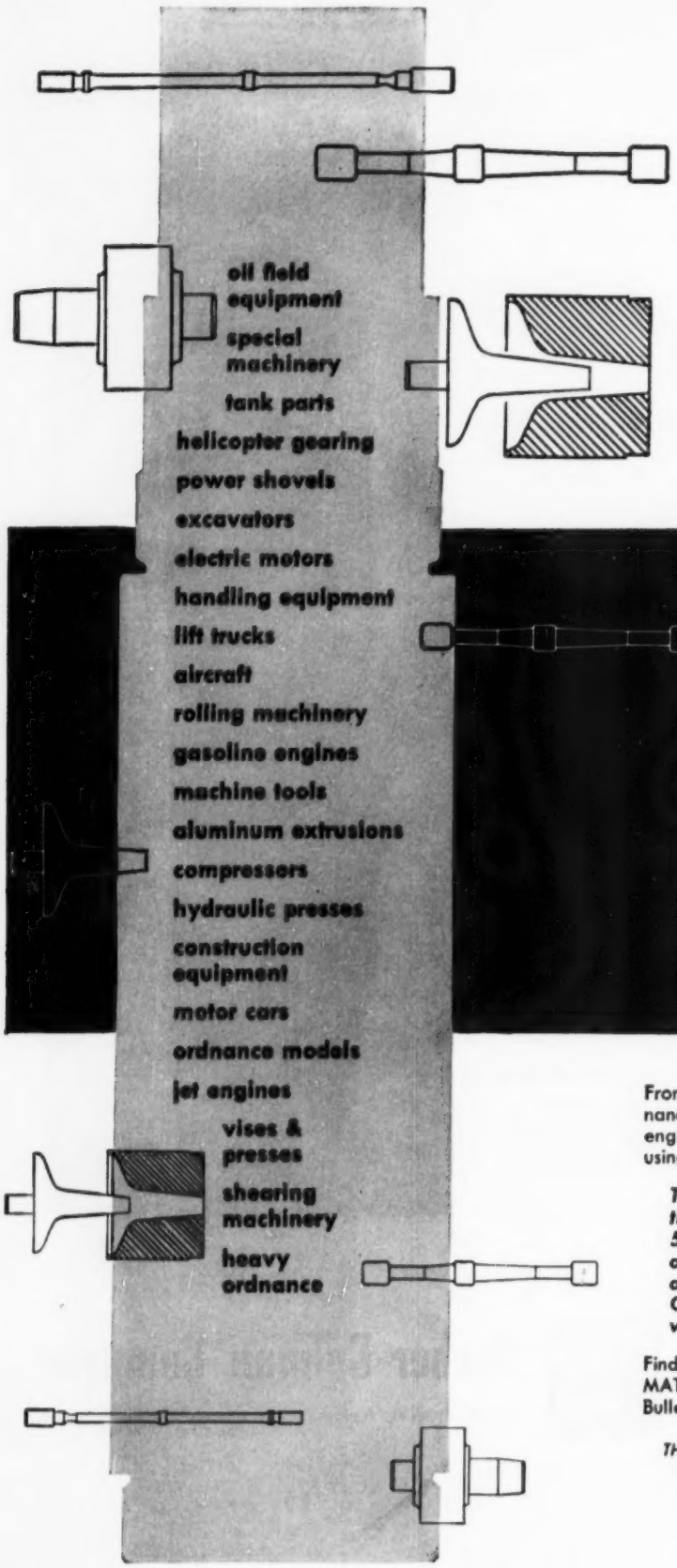
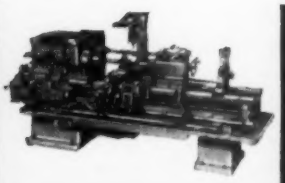
HOBS AND MACHINES SINCE 1911



industry cross-section agrees...



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SAVE time... cost, capital investment, space... manpower

From mammouth construction equipment to ordnance models, from small gasoline motors to jet engines... manufacturers report significant savings using the COPYMATIC.

Time savings run from 22% up to 87%. Production increases from over 100% to as much as 536%! Cost savings range from 40% to an amazing $14,000 in one year. Capital, space and manpower savings are revealed by one COPYMATIC replacing 3 older lathes in one well-known plant.

Find out how much a Lodge & Shipley COPYMATIC can save you. Ask for case histories and Bulletin #675.

THE **Lodge & Shipley** COMPANY
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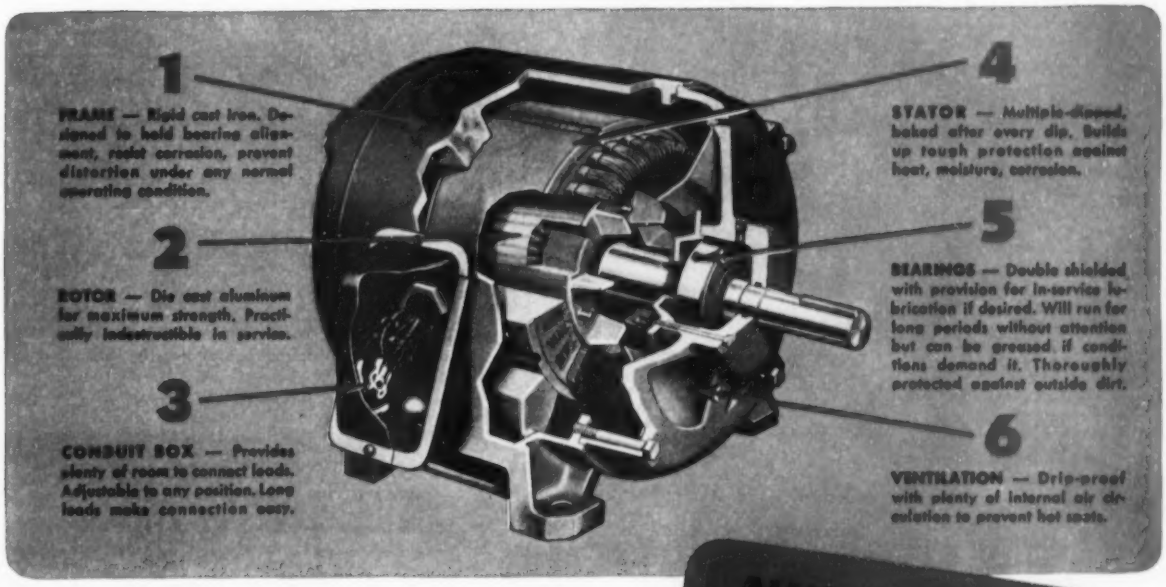
Look for These 6 Signs of Good Motor Design


1
FRAME — Rigid cast iron. Designed to hold bearing alignment, resist corrosion, prevent distortion under any normal operating condition.
2
ROTOR — Die cast aluminum for maximum strength. Practically indestructible in service.
3
CONDUIT BOX — Provides plenty of room to connect leads. Adjustable to any position. Long leads make connection easy.
4
STATOR — Multiple-dipped, baked after every dip. Builds up tough protection against heat, moisture, corrosion.
5
BEARINGS — Double shielded with provision for in-service lubrication if desired. Will run for long periods without attention but can be greased if conditions demand it. Thoroughly protected against outside dirt.
6
VENTILATION — Drip-proof with plenty of internal air circulation to prevent hot spots.

Get Allis-Chalmers Motors for these Extra Values!

ALLIS-CHALMERS **MOTORS**

Certified Service — Nearly 100 Allis-Chalmers Certified Service Shops provide factory-approved parts and service on your Allis-Chalmers motors. Screened for modern equipment, adequate experience and business integrity, these independently owned service shops will provide you with prompt, economical repair and maintenance.

Complete Drives from One Source — Allis-Chalmers can supply your complete drive — motor, control and *Texrope* V-belt drive — from one convenient, reliable source.

Application Engineering — Your Allis-Chalmers District Office representative or Authorized Dealer will be glad to help you select exactly the right motors for your needs. For additional information, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6052. A-3954

Texrope is an Allis-Chalmers trademark.

Sold . . .
Applied . . .
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by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

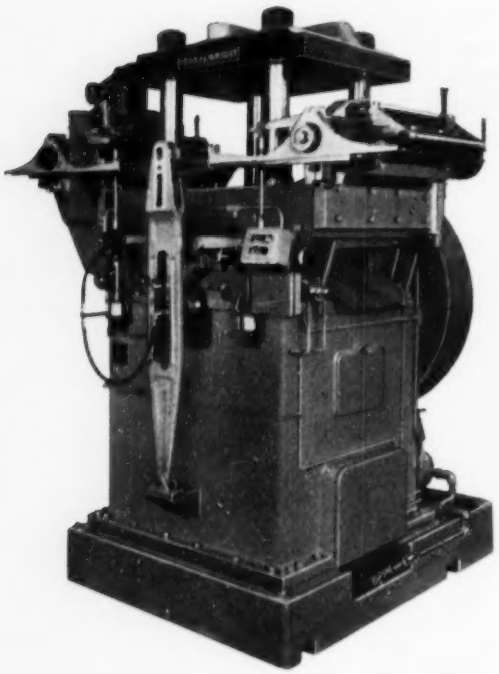
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

ALLIS-CHALMERS

A PROFIT WITH EVERY STROKE



Our customers say that. It figures. One Dieing Machine does the work of five to ten conventional stamping presses. One stroke—a complete part. One inspection. One trip for parts removal. Speed—you can pull out the throttle. Die life—longer for two reasons. (1) Stability, minimum vibration, extreme precision of tools alignment. (2) Dies take less of a beating; less metal needs to be removed for sharpening. Our men can give you the whole Dieing Machine story. If you want to cut costs, now's the time to talk to one of them—a note from you will have an H & W man on deck promptly.

NEW CATALOG Up-to-the-minute facts on Dieing Machines. Capacities now range from 25 tons to 2500 tons. Catalog gives specifications up to 400-ton machine. Write Henry & Wright, 481 Windsor St., Hartford, Connecticut.

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

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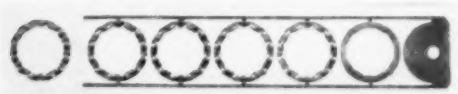
TYPICAL JOBS THAT SHOW A PROFIT AT EVERY STROKE

Automotive stamping produced complete per stroke from 3/32" thick by 13" wide hot rolled steel in coils on 200-ton Dieing Machine, single gear type, equipped with progressive die. Speed approximately 45 strokes per minute.

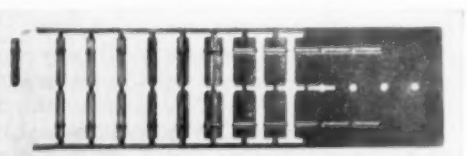


Ball bearing retainer produced complete in 75-ton Dieing Machine operating at speed of 95 strokes per minute. Made from 4 3/8" wide by .034" thick cold rolled steel.

Ferrule. One completed piece produced per stroke in 50-ton Dieing Machine operating at speed of 90 strokes per minute. Made from 9/16" diameter by 7/8" long by .030" thick cold rolled steel.

C-Clamp Frame. Both halves produced complete in 150-ton Dieing Machine operating at speed of 65 strokes per minute. Material—cold rolled steel .086" by 4 3/8" wide.

Support bracket produced complete one per stroke in 150-ton Dieing Machine operating at speed of 60 strokes per minute. Made from .062" thick by 7 1/4" wide cold rolled steel.



Radio tube prong produced complete in 25-ton Dieing Machine at rate of 450 pieces per minute. Made from brass .012" by 7 7/16" wide.

Bathroom fixture produced in 60-ton Dieing Machine operating at speed of 100 strokes per minute. Made from .032" thick by 1 3/4" wide cold rolled steel.

Hardware item. One completed piece produced per stroke in 100-ton Dieing Machine operating at speed of 75 strokes per minute. Made from 3" wide by .040" thick cold rolled steel.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Invisible Cracks and How They Were Cured

One of our customers reported trouble with a roll used in the making of fine silverware. Made of A-H5, our 5-pct chromium air-hardening steel, the roll was of 6-in. diameter with a 10-in. working face, highly polished. It worked fine at first. Then a fine network began to show up on the silverware being rolled.

We suggested that the customer bring the roll to our plant, where we have the most modern facilities for diagnosing ailing tools and dies. When the roll was magnetic-particle tested, what appeared to the eye as a beautifully polished surface was revealed to be a fine network of grinding cracks.

"Never had that kind of cracks before," said the customer. "Can we get rid of them on a roll of such high hardness?"

"Yes," we replied. "But it's going to be a tricky job." So we checked with the experts in our division that produces hardened steel rolls. "It's not easy," they told us, "but it can be done. Use a wheel with a very coarse grit with a soft binder. Remove the surface at a maximum rate of .0005 in. per pass. You'll clean up the cracks somewhere between .005 and .010 in."

Then we checked with our specialist on grinding wheels, who gave us the exact code numbers for the grades of wheels that would make it possible to salvage the roll—and also prevent the recurrence of grinding cracks. Our customer went away well satisfied . . . and he's still using A-H5 with fine results.

Bring your tool or die troubles to our technical staff for advice that's based on years of practical experience—not just in making fine tool steel and in helping customers solve their problems, but in using hundreds of tons of our own tool steel each year in our manufacturing divisions. Perhaps we can help *you!*

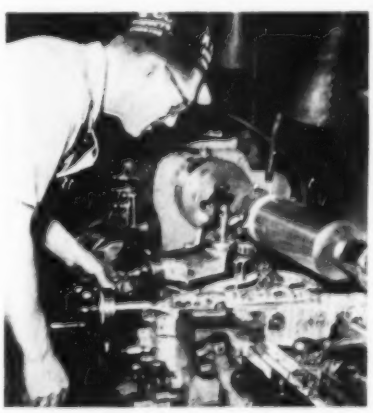
This piece of Omega tool steel, tops in resistance to cold shock, will see service as a retainer block for a header die that is subjected to terrific loads in the cold-heading of steel artillery shell cases.

Some rough forgings of Lehigh S tool steel provide an interesting contrast to the finished liner for a tapering die which puts the desired taper on a 105-mm shell case after it has been headed.

COLD-EXTRUDING CALLS FOR GOOD TOOL STEEL

Great advances are being made in the technique of cold-extruding steel. It's a development that opens up new horizons in metalworking. The severity of this type of work calls for a variety of blue-ribbon tool steels—some must have the ultimate in wear-resistance, others must withstand terrific shock.

Bethlehem tool steels are in plentiful evidence wherever cold-extrusion tools and dies are being made. The accompanying photographs, made at Carando Machine Works, Stockton, Calif., show punches and dies being made from Bethlehem tool steels for use in the cold-extrusion of steel shell cases.



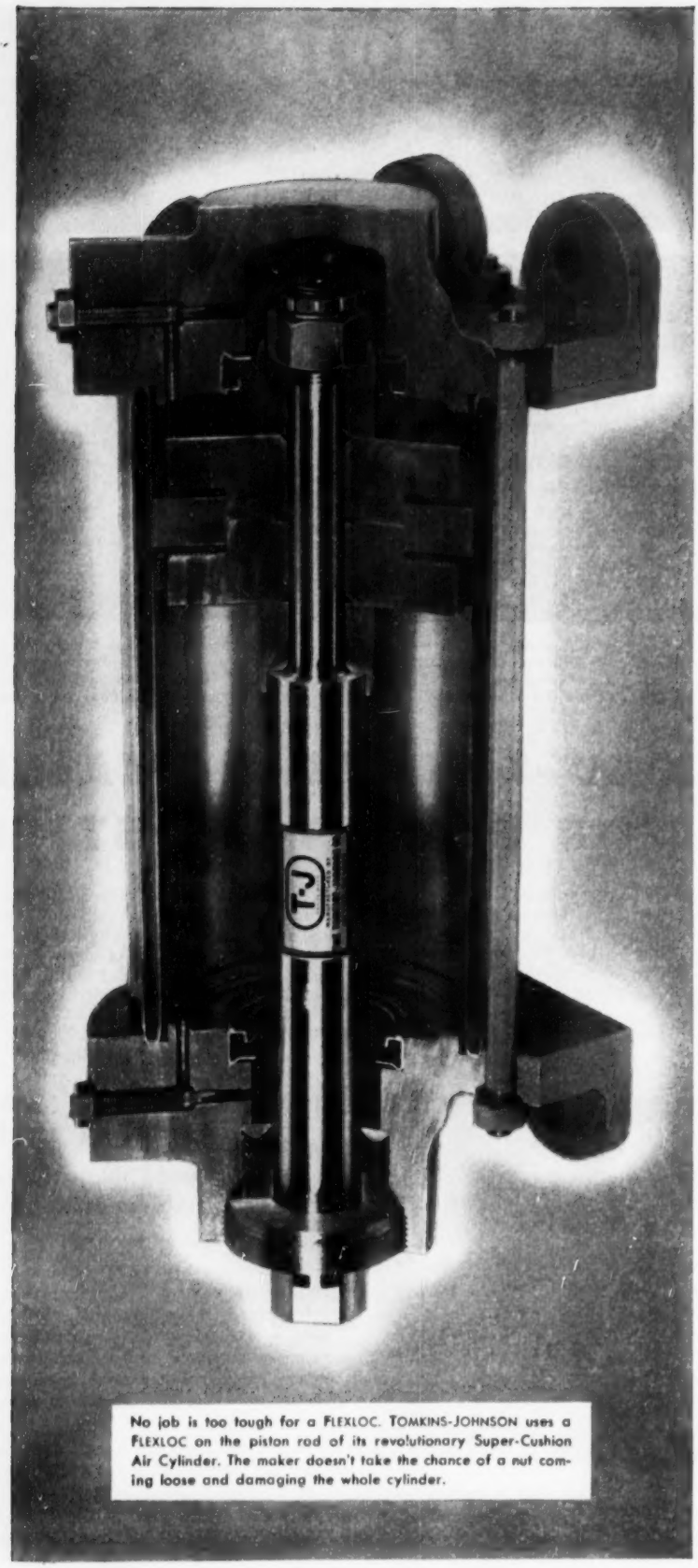
A bar of Lehigh S is being turned in a lathe to form a draw punch for a 3-in. cartridge case. Lehigh S has the highest wear-resistance of Bethlehem's high-carbon, high-chromium grades. It also holds to accurate size in heat-treatment.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

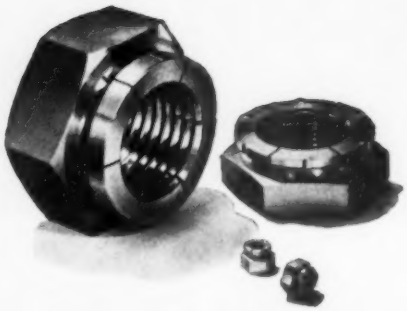
Avoid sharp corners in designing tools

Tools designed with sharp corners, such as in square holes, can often be produced satisfactorily when liquid-quenched tool steel is used. However, such designs are often so hazardous that a large percentage of cracked tools can be expected, no matter how carefully the heat-treatment is performed.

When the sharp corners are not necessary, the solution is of course to provide fillets. But when square holes or other sharp corners are essential in the design of the tool, the use of an air-hardening steel is recommended.



No job is too tough for a FLEXLOC. TOMKINS-JOHNSON uses a FLEXLOC on the piston rod of its revolutionary Super-Cushion Air Cylinder. The maker doesn't take the chance of a nut coming loose and damaging the whole cylinder.



What FLEXLOC locknuts do for you

FLEXLOCs eliminate complicated, time-consuming methods of locking threaded fasteners. They offer simpler, faster application and safer, more dependable locking than plain nuts and lockwashers, castellated nuts and cotter pins, or nuts and jam nuts. And they won't work loose.

The reasons for all this are plain. FLEXLOCs are one piece—nothing to assemble, come apart, lose or forget. FLEXLOCs are all metal—have higher tensile than most other locknuts and are not affected by temperatures to 550°F. FLEXLOCs are both stop and locknuts—don't have to seat to lock, and stay put anywhere on a threaded member as soon as their locking threads are fully engaged.

SPS can deliver any quantity of FLEXLOCs in a wide range of sizes. Stocks are carried by industrial distributors everywhere. Write for literature. SPS, Jenkintown 1, Pa.

FLEXLOC

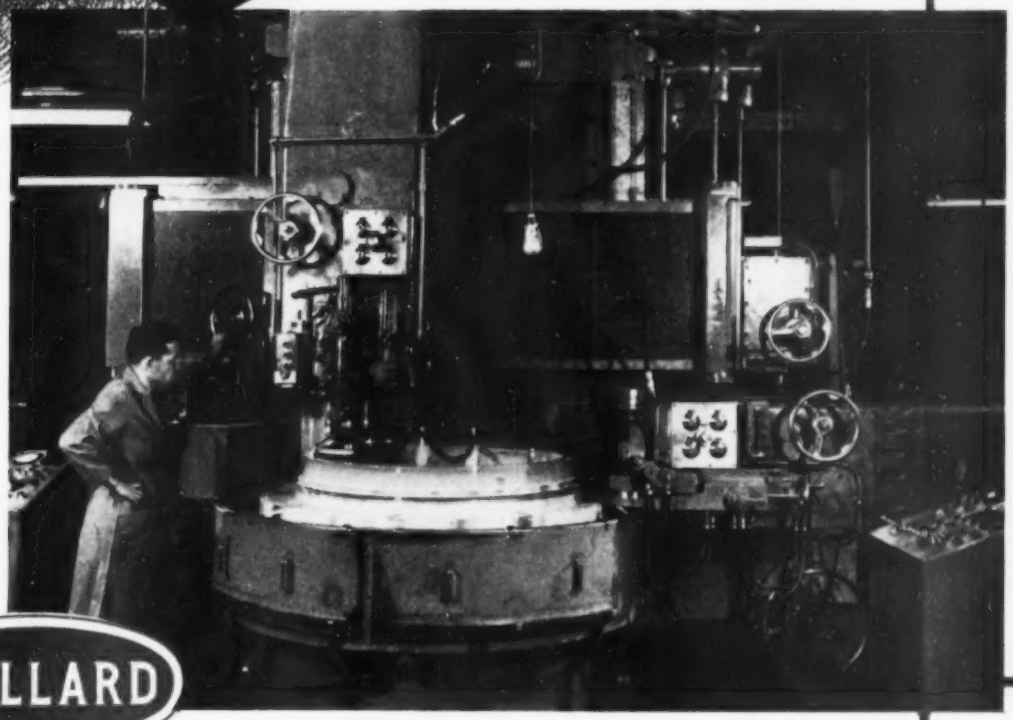
LOCKNUT DIVISION

SPS

JENKINTOWN PENNSYLVANIA

Our Fiftieth Year : A START FOR THE FUTURE

NOW VERTICAL CHUCKING Grinders BY BULLARD



BULLARD

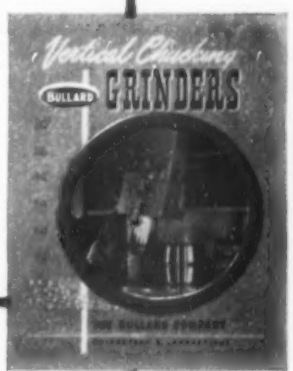
Bullard presents a carefully engineered and developed Vertical Chucking Grinding Machine in a range of sizes to meet present day requirements for conveniently grinding the larger sizes of work.

Years of study of field requirements for a truly accurate machine of this kind have produced this Vertical Chucking Grinding Machine now in operation at THE TIMKEN ROLLER BEARING COMPANY, Canton, Ohio.

It is designed and built with Bullard characteristic Vertical Turret Lathe ruggedness and rigidity, combined with the sensitivity of control and built in precision so essential for successful grinding results.

Precision, flexibility of control, safety design and productive efficiency place THIS LINE OF VERTICAL CHUCKING GRINDING MACHINES as an IMPORTANT item on your list for immediate investigation.

Write now for Delivery dates and complete information, ask for VG-6S.



THE BULLARD COMPANY

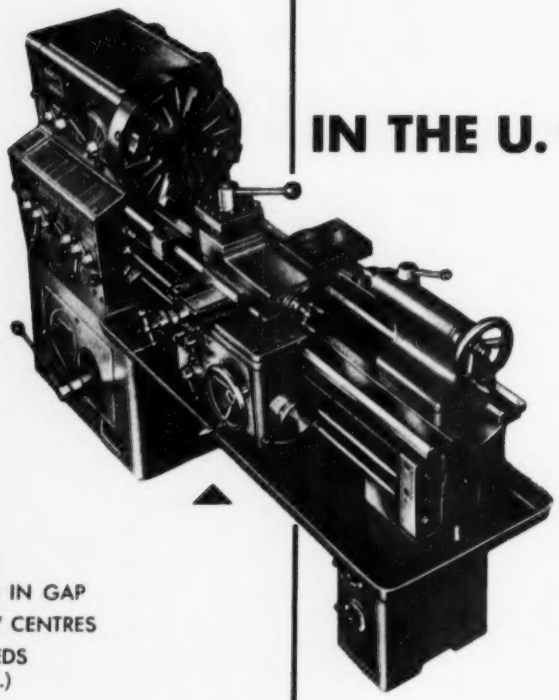
BRIDGEPORT 2, CONNECTICUT

IN EIGHTEEN MONTHS

OVER 500 MEUSER LATHES

INSTALLED

IN THE U. S. AND CANADA



This proves the quality and versatility of these high precision lathes. WIDEST THREADING RANGE OF ANY LATHE ON THE MARKET. New lighter and heavier ranges now added make the following models available for IMMEDIATE DELIVERY FROM NEW YORK & MONTREAL STOCKS . . .

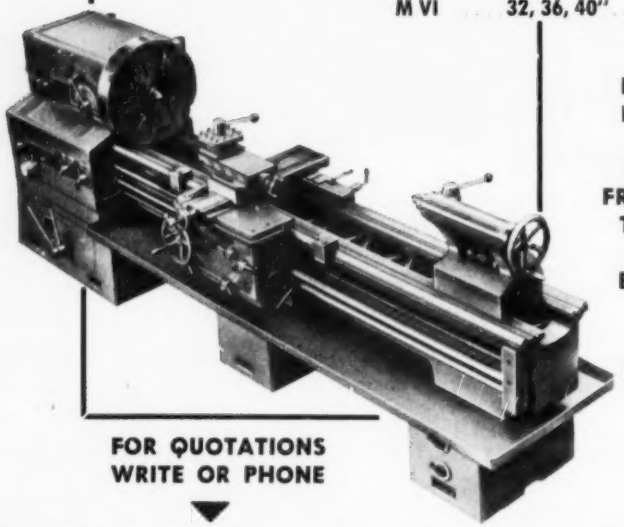
MEUSER MI

14", 16" SWING
21", 23" SWING IN GAP
x 30"-40"-60"-80" CENTRES
12 SPINDLE SPEEDS
(25-1120 R.P.M.)

RANGE	SWING	DISTANCE BETWEEN CENTRES	H.P.
M 0	14 and 16"	30- 80"	2
M I	14 and 16"	30- 80"	3
M III	16, 18, 20"	30-160"	5
M IIIA	20 and 22"	40-160"	7.5
M IV	20, 24, 28, 32"	40-240"	10
M V	28, 32"	40-240"	15
M VI	32, 36, 40"	40-240"	20

MEUSER MIV

20", 24", 28", 32" SWING
30", 34" 38", 42" SWING IN GAP
x 40"-60"-80"-100"-120"-140"-160"-200"-240" CENTRES
27 SPINDLE SPEEDS
(7.8-900 R.P.M.)



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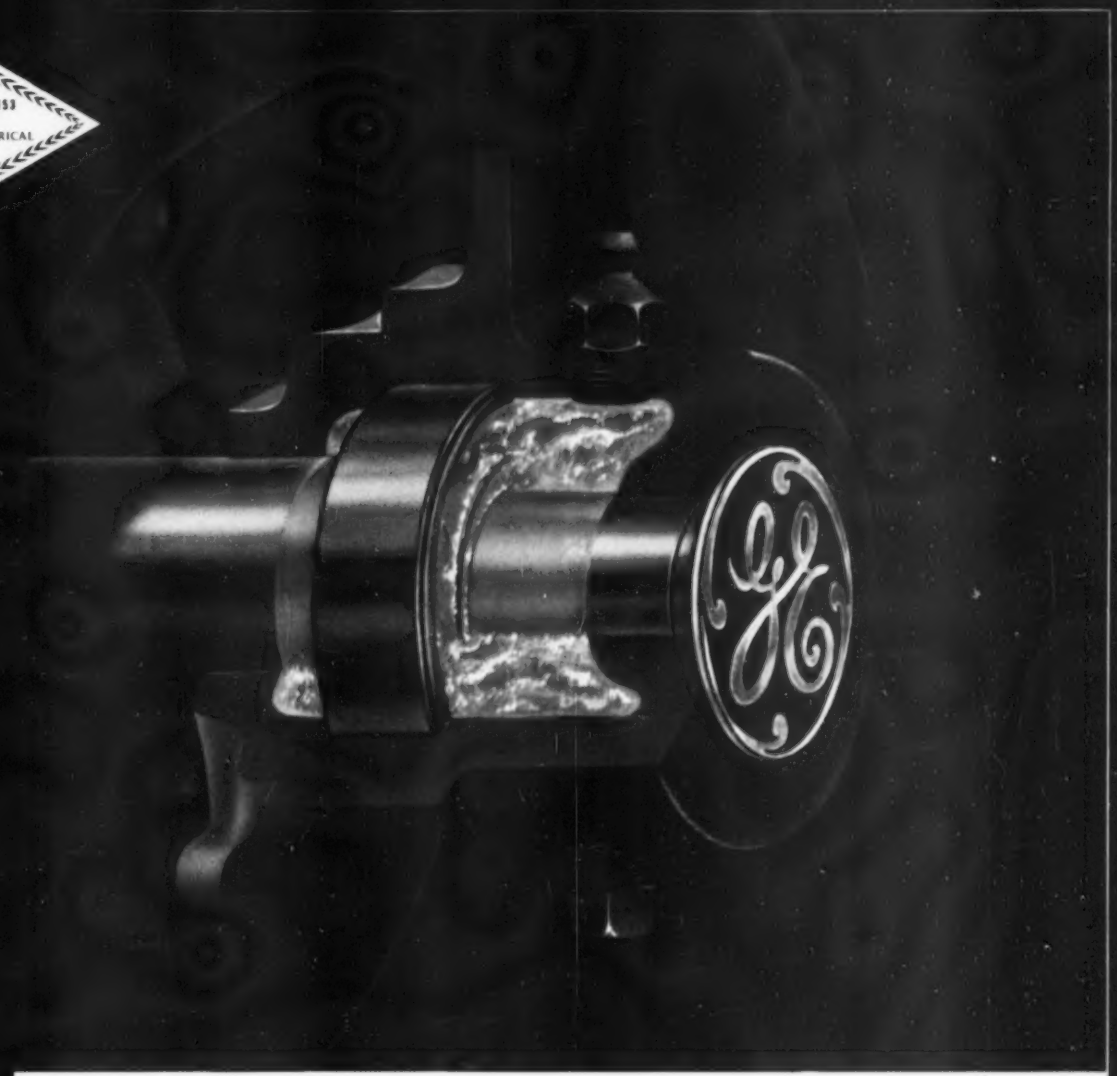
YEARS OF ELECTRICAL PROGRESS



These bearings last longer than life . . . grease life

G-E *TRI-CLAD* MOTORS LAST LONGER

REG. U.S. PAT. OFF.

ALL GREASE LIFE IS LIMITED. The best known greases dry out in time. This may be six months, seven years, or longer, depending on motor application.

SOME MOTORS ARE USELESS WHEN GREASE DRIES OUT. They can't be regreased, you lose production time . . . because your maintenance man is "sealed out."

BUT GREASE LIFE NEED NOT LIMIT MOTOR LIFE. Tri-Clad motors give long life without relubrication, plus provision for adding new grease when necessary.

ADDED GREASE IS USEFUL GREASE. Relubrication puts fresh grease in storage in bearing housing . . . as motor operates, grease oils migrate to bearing as needed.

TRI-CLAD MOTOR BEARING IS EASIEST TO REGREASE. Do it on the job, with motor running . . . no dismantling . . . no trip to a service shop.

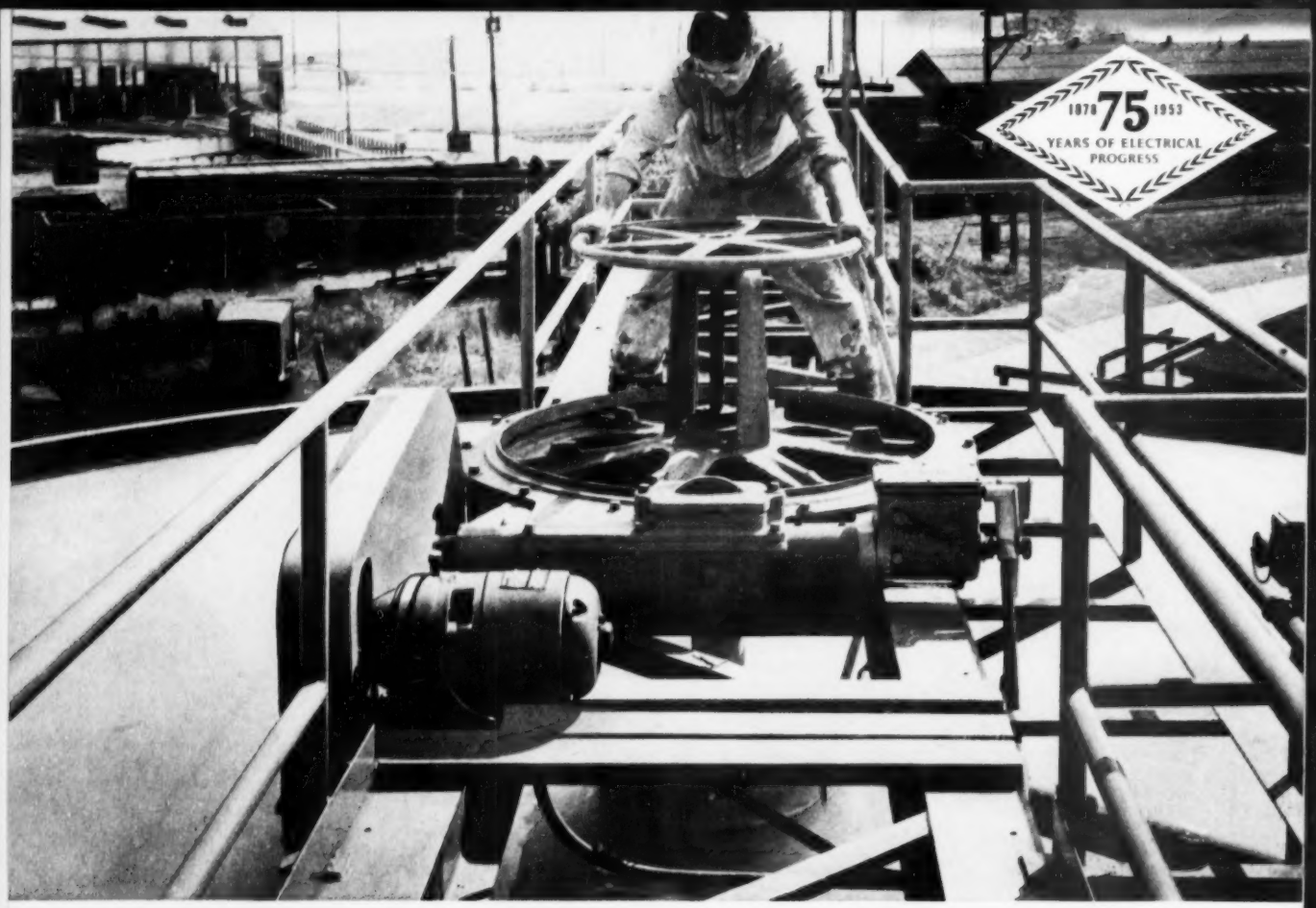
TRI-CLAD MOTOR BEARING IS BETTER PROTECTED. Completely enclosed housing has *longer seals* to keep dirt out, *larger grease supply*, and *scientific design* for continual grease migration.

THIS PRACTICAL BEARING DESIGN is one more reason why G-E Tri-Clad motors give better service . . . added life. Order through your nearby G-E Apparatus Sales Office or authorized G-E agent or distributor. General Electric Company, Schenectady 5, N. Y.

752-18

You can put your confidence in

GENERAL ELECTRIC



THIS G-E GEAR-MOTOR WAS PICKED TO RUN A SLUDGE ACCUMULATOR 24 HOURS A DAY AND 7 DAYS A WEEK BECAUSE . . .

New G-E Gear-motor Reduces "Down-time"

Easy stator removal, use of Tri-Clad* motors, cuts maintenance costs and time more than 50%.

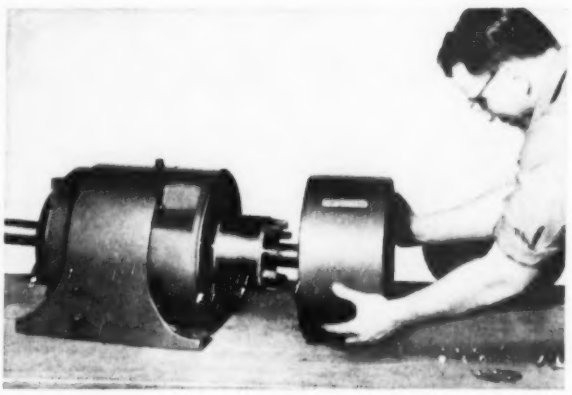
G-E Gear-motors are single units—compact and efficient—the most economical method of gear reduction for low-speed drives. This year, they have been redesigned to offer you additional operating economy.

EASY STATOR REMOVAL is now possible without disturbing the gear-train in any way. Also, any standard G-E motor—with or without feet—may be used as a stator replacement. These advantages mean a reduction of non-productive "down-time"—and substantial cost savings!

TRI-CLAD MOTORS are now an integral part of every G-E Gear-motor. These are the same motors which have gained such a wide acceptance throughout industry—the motors which assure you of extra reliability—triple protection against physical damage, electrical breakdown, and operating wear and tear.

A new stocking plan keeps most popular ratings available on a 1-week basis. You can order your gear-motor from your nearest G-E Apparatus Sales Office or your Authorized G-E Agent or Distributor. General Electric Company, Schenectady 5, N. Y. 735-10

Registered Trade-mark of General Electric Company



Rabbet fit between stator and gear-motor frame assures positive realignment. Note that stator removal is simply a matter of removing a few bolts—can be done without disturbing gear-train.

GENERAL ELECTRIC

Here's the difference between Hydroforming and conventional deep drawing

CONVENTIONAL METHOD

Fig. 1 shows the forming of a hemisphere with a standard draw die equipped with a die cushion. For satisfactory drawing, an accurately controlled, infinitely *variable* blank holding pressure during the drawing cycle is most desirable and such a feature is rarely available on conventional presses.

Conventional tooling requires that the material be drawn over a fixed die radius. A very small die radius may cause spot stresses, thin-out and tearing. A very large die radius may cause wrinkles and puckers to be formed in the part.

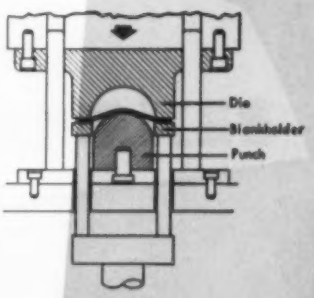


Figure 1

HYDROFORM METHOD

Note in Fig. 2 the simplicity of tooling required to produce the same hemisphere by Hydroforming.

Pressure in the forming cavity above the flexible diaphragm can be established to the setting desired. The flexible diaphragm acts as a blank holder and universal die, applying pressure uniformly over the entire blank surface. This, in some instances, accomplishes a preliminary forming of the part. Then the punch is moved upward and proper control of the pressure in the forming cavity forms the material to the punch.

The forming cavity pressure normally increases throughout the draw, causing the forming or draw radius to decrease progressively, as shown in the photo at right. This transition of the radius from large to small facilitates the "flow" of the material. Those portions of the blank which have been formed are held firmly in contact with the punch, preventing further stress or strain in those areas. The continuous wrap-around action of the flexible die member, plus the accurately controlled forming pressure, produces consistently uniform parts, free from the defects described above.

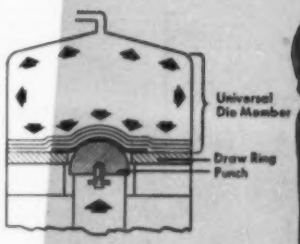
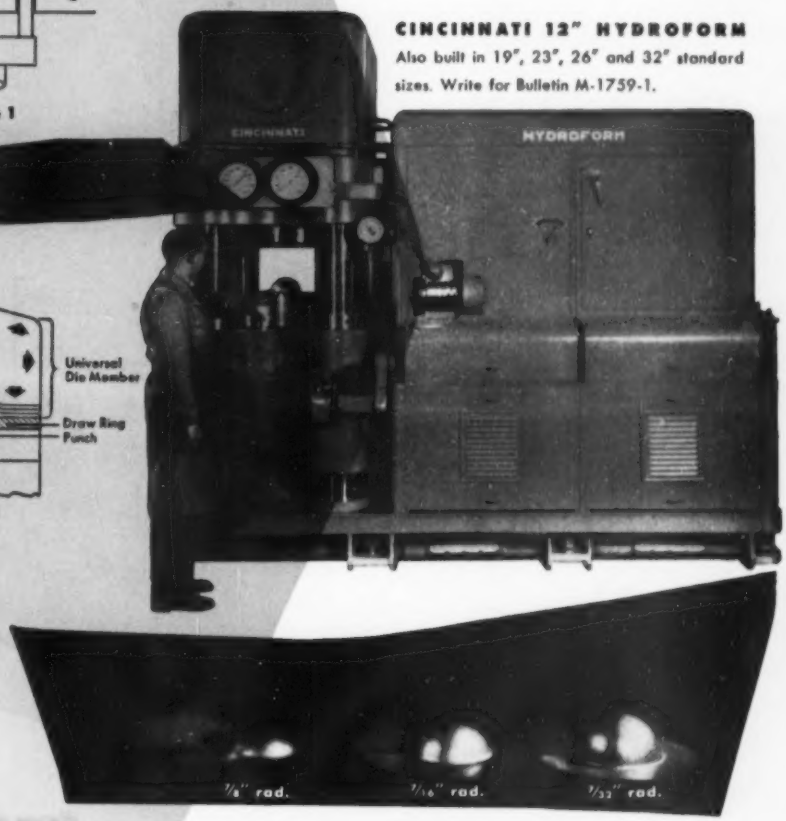


Figure 2

CINCINNATI 12" HYDROFORM
Also built in 19", 23", 26" and 32" standard sizes. Write for Bulletin M-1759-1.



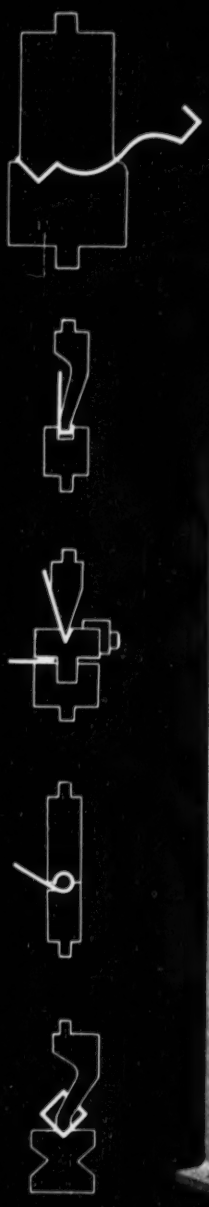
Can you convert the advantages of Hydroforming into production profits?

Through Hydroforming, deeper draws and more intricate shapes can be formed in one operation than is possible by conventional forming methods. Tool costs are reduced 50% or more. Part quality is materially improved. Short-run production is made exceptionally economical. Can you apply these Hydroforming advantages to your production? Call in a Cincinnati Milling field engineer.

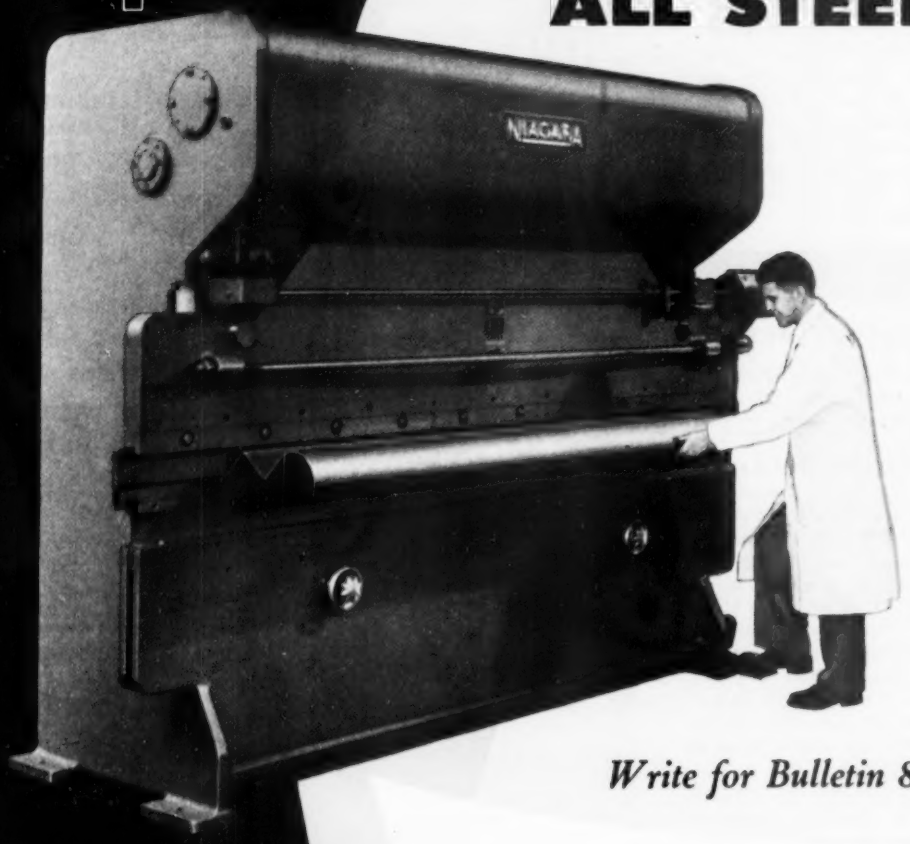
CINCINNATI Hydroform

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

NIAGARA



A NEW ALL STEEL



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50 TON SERIES

For Fabricating Sheet Metal and Light Plate

THESE HIGH SPEED PRESS BRAKES are perfectly suited for the smaller, and lighter jobs that do not justify a large investment in equipment. They offer the advantages of big brake performance by incorporating features ordinarily found only in large expensive machines.

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TYPE HG is primarily designed for hardening of carbon and alloy steels without scale or decarb when used with Endogas® atmospheres. Exogas® may be used to minimize scaling when decarb is not a factor. It can be used without atmosphere.

FOR YOUR TOOLROOM Box Type H furnaces are designed for application where batch production is possible and where a protective atmosphere is not required. They have an operating temperature range from 1200°F. to 1850°F. Safe loading capacity at 1600°F. is 180 lbs./sq. ft. of hearth area.

FOR YOUR LABORATORY Box Type B furnaces are designed for light or intermittent duty where protective atmosphere is not necessary. Short legs are furnished for bench mounting in laboratories. Automatic temperature control permits closely controlled heat-treating.

Get Westinghouse furnace flexibility ...for job-lot production problems

Westinghouse Box Type Furnaces are completely flexible and versatile in application. They may be utilized over a wide temperature range for annealing, preheating, hardening and tempering operations on tools and small parts. Brazing or other joining methods may be combined with heat-treating . . . done at the same time to give best results at vastly *LOWER PRODUCTION COSTS.*

Whether it be for your production line, toolroom or laboratory, you'll get the heat-treating flexibility and versatility you need and want at low costs with Westinghouse Box Type Furnaces. For more information use the coupon below, or contact your nearby Westinghouse Office. Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pennsylvania. J-10391

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Here's the start...

of the new concept that created

CINCINNATI Grinding Wheels

Cincinnati Grinding Wheels began with a frank recognition of the grinding grit as a cutting tool. For research discoveries by Cincinnati Milling proved, beyond doubt, that the grinding process is a true metal cutting process. The grinding grits (such as the one magnified above) do not abrade or wear away the surface of a workpiece but form chips which agree in classification with the basic chip types found in other metal cutting processes.

This entirely new approach is not based on hasty conclusions. It represents 25 years of Cincinnati Milling research, coupled with practical experience

in applying the basic fundamentals of grinding to a wide variety of work on both centerless and centertype machines.

This new concept is the beginning of a new approach to grinding wheels—the development of the wheel as a true cutting tool. And it is a development you might expect from Cincinnati Milling, with the world's largest background of research and experience in metal cutting operations.

For you, this means grinding wheels developed and tested over a period of several years on the basis of true function—as true cutting tools forming true chips.

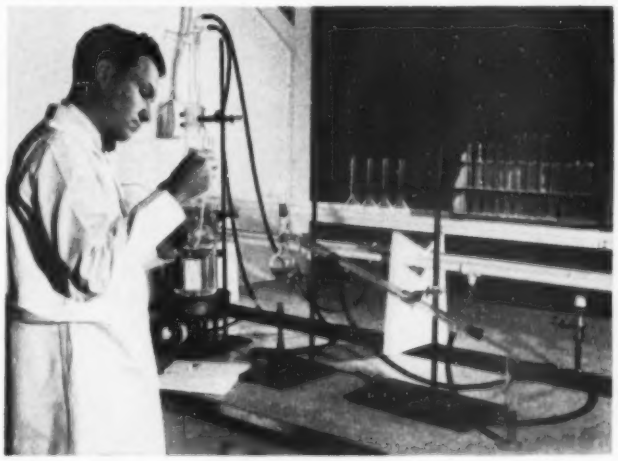
Available to you is a field organization of trained machinists who know grinding and grinding machines as well as grinding wheels. For a demonstration on your own machines of how to get the most out of Cincinnati Grinding Wheels, write, wire or phone Cincinnati Milling Products Division, The Cincinnati Milling Machine Co.

RESEARCH GRINDING problems have ranged from the grinding of surgical sutures .0004" in diameter to steel mill rolls 60" in diameter. A machinist of the research department is shown using special workpieces to compare wheel performance on a centertype grinder.

EXTRACTION APPARATUS is used by research laboratory to measure degree of maturity of resin bonds.

CONTINUOUS GRINDING CHIP obtained from grinding operation on SAE 1112 steel, selected to indicate the free chip formation possible under good grinding conditions.

CONTINUOUS MILLING CHIP obtained from helical milling operation on SAE 1112 steel. Note similarity in shape to the grinding chips.



FREE BOOKLET. Now available to industry is a new booklet entitled "A New Concept In Grinding Wheels." It contains valuable information for everyone interested in grinding operations. A copy is yours for the asking. Write Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Sure signs of precision production

Fine tools are the surest sign of expert craftsmanship in any trade. And, for the machinist, none are finer, more reliable than Brown & Sharpe Machinists' Tools. They command a respect and confidence which are reflected in greater accuracy and increased output of your precision products. They are found wherever precision production is paramount.

The complete line of Machinists' Tools is fully described in the Brown & Sharpe Small Tools Catalog. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

Buy through your local Distributor

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TAPS *by* CARD

Performance on the job **is what guides all Card manufacture. For generations, Card has had but one objective — to make the best taps money can buy.**

S. W. CARD MANUFACTURING CO., MANSFIELD, MASS. • DIVISION OF UNION TWIST DRILL CO. The CARD Quality **TAPS • DIES • SCREW PLATES**

"Here's a swell welder's glove, Joe!"

Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and w ist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and feel the other six gloves and mittens in this top quality AO line.

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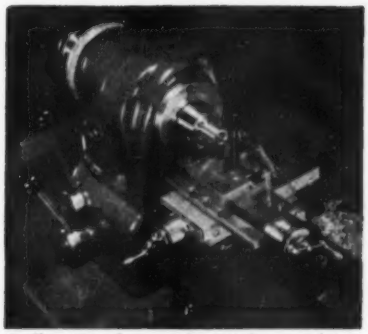
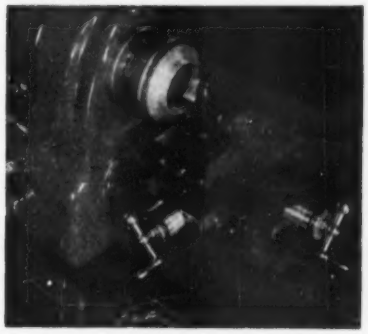
HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE

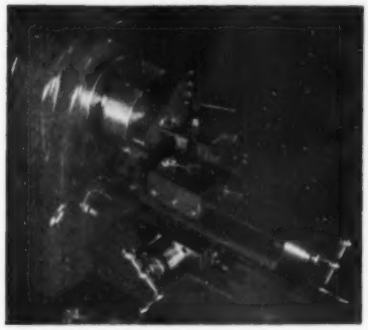
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of one-inch or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

Face Plate Work — 9" slotted and tapped face plate for holding irregular shapes.

SPECIFICATIONS:
1" Collet Capacity
9" Swing
17" Center Distance
8 Speeds to 4000 rpm.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59

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"MARVEL" HAS
always had the edge

MARVEL High-Speed-Edge Blades assure Faster more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back, with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, comes the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1. High-Speed-Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

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MARVEL *Metal Cutting* SAWS

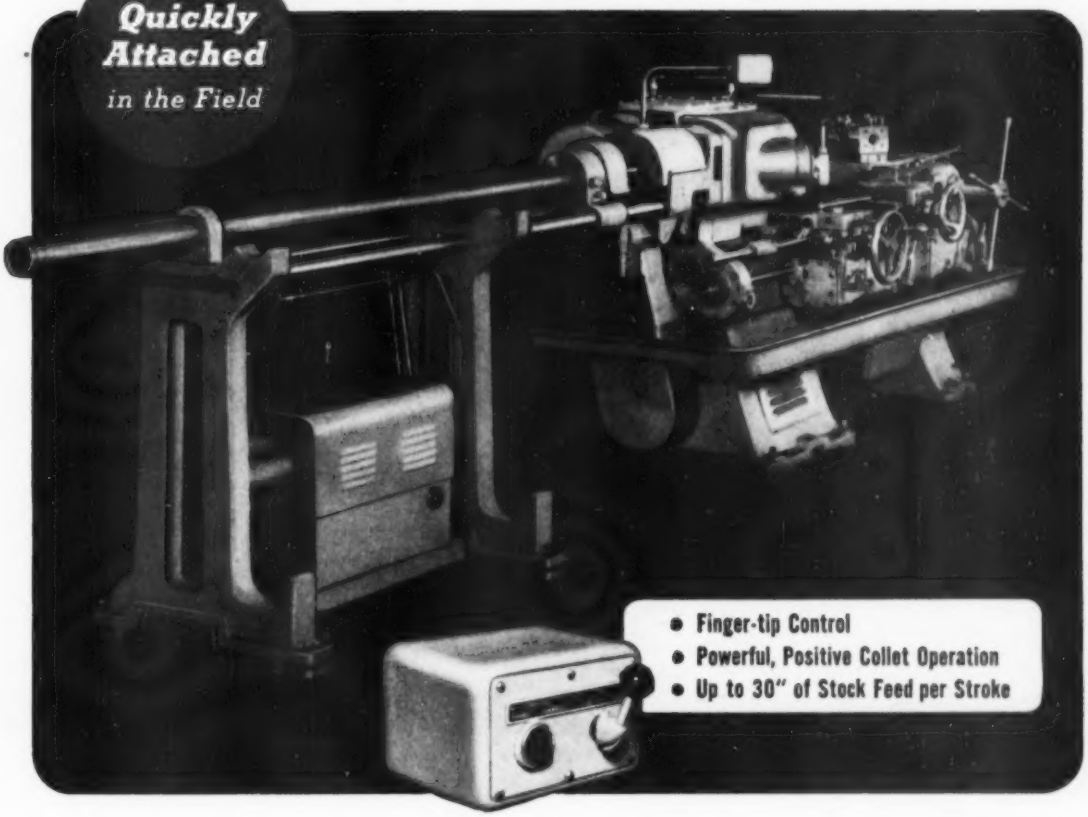
Better Machines–Better Blades

Power Operated

COLLET CHUCK AND BAR FEED

Increases production

. . . cuts turning costs



This new, work-saving development is a rigid, heavy-duty hydraulic unit built to handle full capacity bars at full capacity spindle speeds.

It provides effortless finger-tip control of bar feeding and chucking, enabling operators to *maintain a faster, steadier pace throughout the day.*

It can be attached quickly to ANY J & L No. 3, 4, 5, 7A and 8A Universal Turret Lathe in the field.

★ Handles ● ■ or ⬢ stock
★ Side-loading, silent safety tube
★ Heavy, wide support legs
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★ Auxiliary feed chuck available

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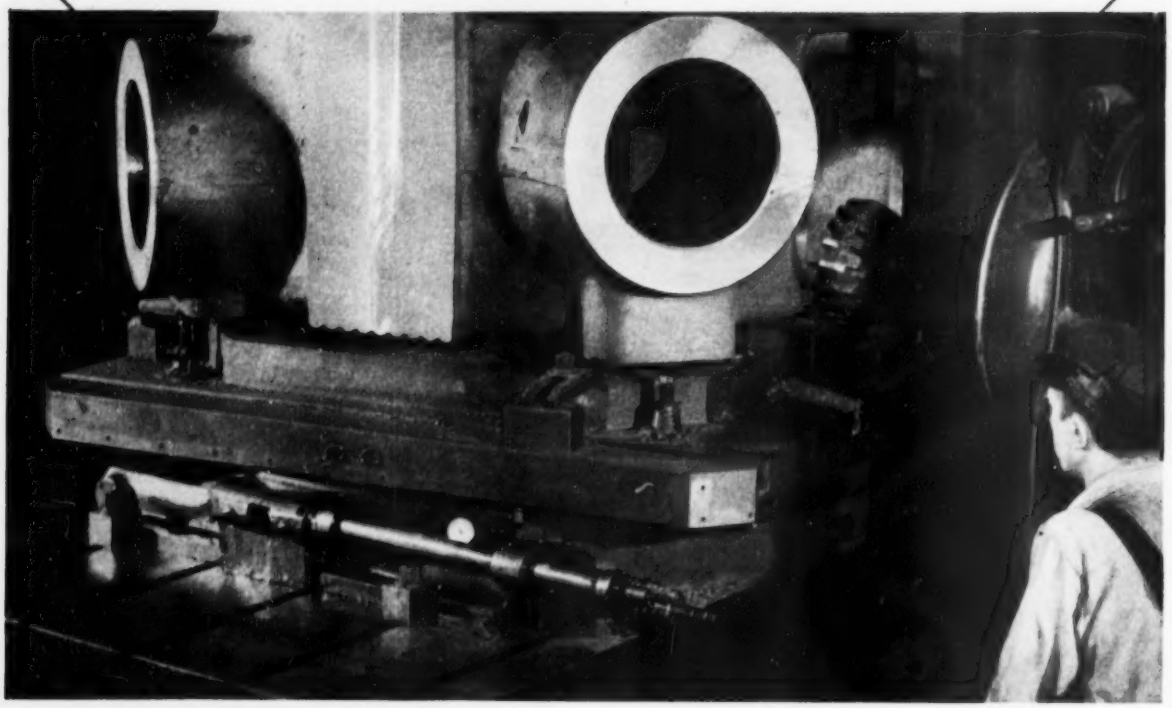
How to beat multiple setups and cut unit costs too!



Giddings & Lewis Rotary Tables increase machine flexibility and working range on Horizontal Boring Mills

G&L Rotary Tables turn set-up time into profit time, perform many complex machining operations in a *fraction of the time* it takes on conventional tables. You can rotate and rapidly index work in horizontal, vertical or tilted positions without usual delays.

Illustration shows combination plain and hand feed Rotary Table that may be turned rapidly by hand to approximate position. Fine adjustments are made with hand crank. Other round or square sizes are available up to and including the 60" x 96" rectangular platens. Close-limit machining is made possible by table graduations to ½°, handy indexing stops, and dial indicator, accurate to .001".

For all the information on G&L Rotary Tables for all types of horizontal boring, drilling and milling machines — write direct or contact your nearest G&L Distributor for bulletin A-20.

Available in Plain, Hand and Combination Power Feed Models

PLAIN — recommended for light work of two or more surfaces. Sizes: Round — 24" to 48"; Square 30" to 48".

HAND — recommended for several surfaces. Round — 24" to 30".

COMBINATION, PLAIN, HAND AND POWER FEED — has 18 power feeds. Sizes: Round — 36" to 60"; Square 36" to 60", Rectangular — 36" x 48" to 60" x 96".

GIDDINGS & LEWIS MACHINE TOOL CO.
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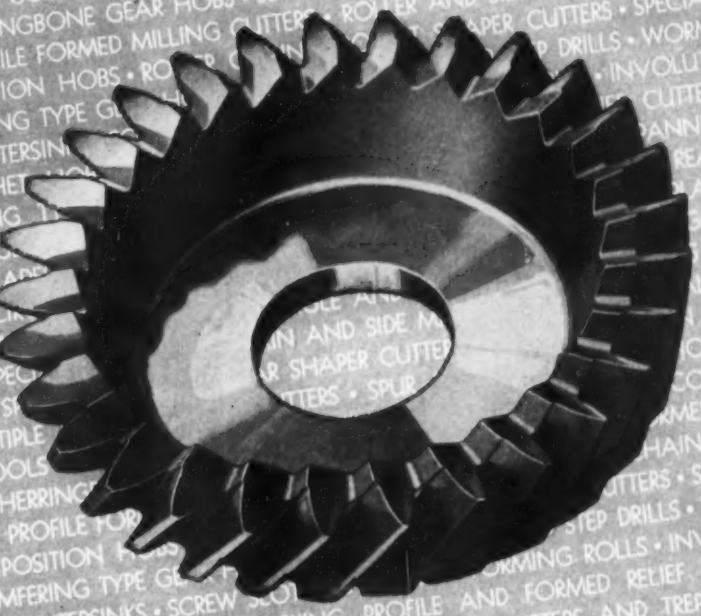
FOR THOSE TOUGH *Special* JOBS ...DEPEND ON

National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

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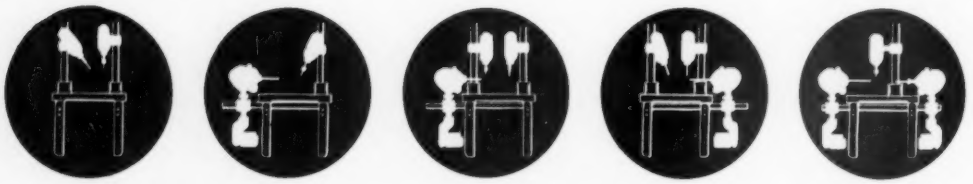
MAGNA DRILL

the completely universal drilling machine

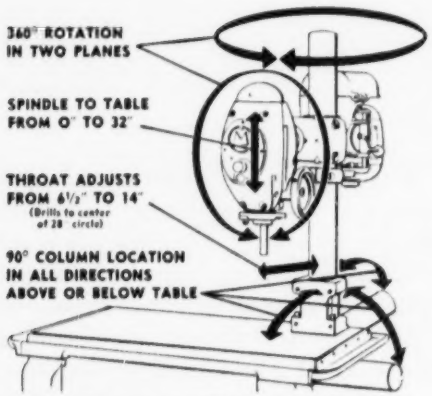


If you're still drilling holes one at a time, there are important new production economies waiting for you in MAGNA DRILL, the completely *universal* drilling machine. MAGNA DRILL increases speed and accuracy, cuts tool and labor costs . . . in both large and small shops, in both limited and mass production.

Key to these benefits lies in MAGNA DRILL'S complete versatility. Any number of heads can be set up quickly and accurately for simultaneous multiple drilling . . . each with its own speed, feed and drilling angle. MAGNA DRILL takes any attachment and performs any operation possible with a conventional drill . . . plus complete freedom of spindle location. The self-contained power feed can be actuated manually or by solenoid for simultaneous or sequential operation.

MAGNA DRILL can be changed quickly from one setup to another *without special tooling!*

MAGNA DRILL duplicates the economies of elaborate, custom-built, multi-spindle machines. Yet it is so adaptable that even short runs can be produced at amazingly low costs. Where tumble jigs are used, savings are even more impressive, since all holes can be drilled at the same time.


360° ROTATION IN TWO PLANES
SPINDLE TO TABLE FROM 0" TO 32"
THROAT ADJUSTS FROM 6½" TO 14"
(Drills to center of 28" circle)
90° COLUMN LOCATION IN ALL DIRECTIONS ABOVE OR BELOW TABLE

As a single, gang, or multi-spindle unit, MAGNA DRILL is a rugged, *precision*, production tool. Enclosed drive adds to safety. Adjustable throat and angular freedom increase versatility.

SEE MAGNA DRILL DEMONSTRATED!

It can perform almost any drilling, tapping, reaming, counterboring, or similar operation! Just fill out and mail the coupon for complete literature.

SPECIFICATIONS

Capacity: in steel	¾"
in cast iron	1"
Stroke	5"
Throat (variable)	drills to center of 28" circle
Spindle speeds: 1800 rpm. motor	380 to 3430 rpm.
3600 rpm. motor	760 to 6860 rpm.
Power feed rates	.003", .005", .008", .012" per rev.
Motor recommended	1 hp.

MAGNA ENGINEERING CORPORATION
Dept. 236-L at factory nearest you:
12819 Coit Rd., Cleveland 8, Ohio, *or*
Menlo Park, California

☐ Please send me more information about MAGNA DRILL.

☐ Have a representative call.

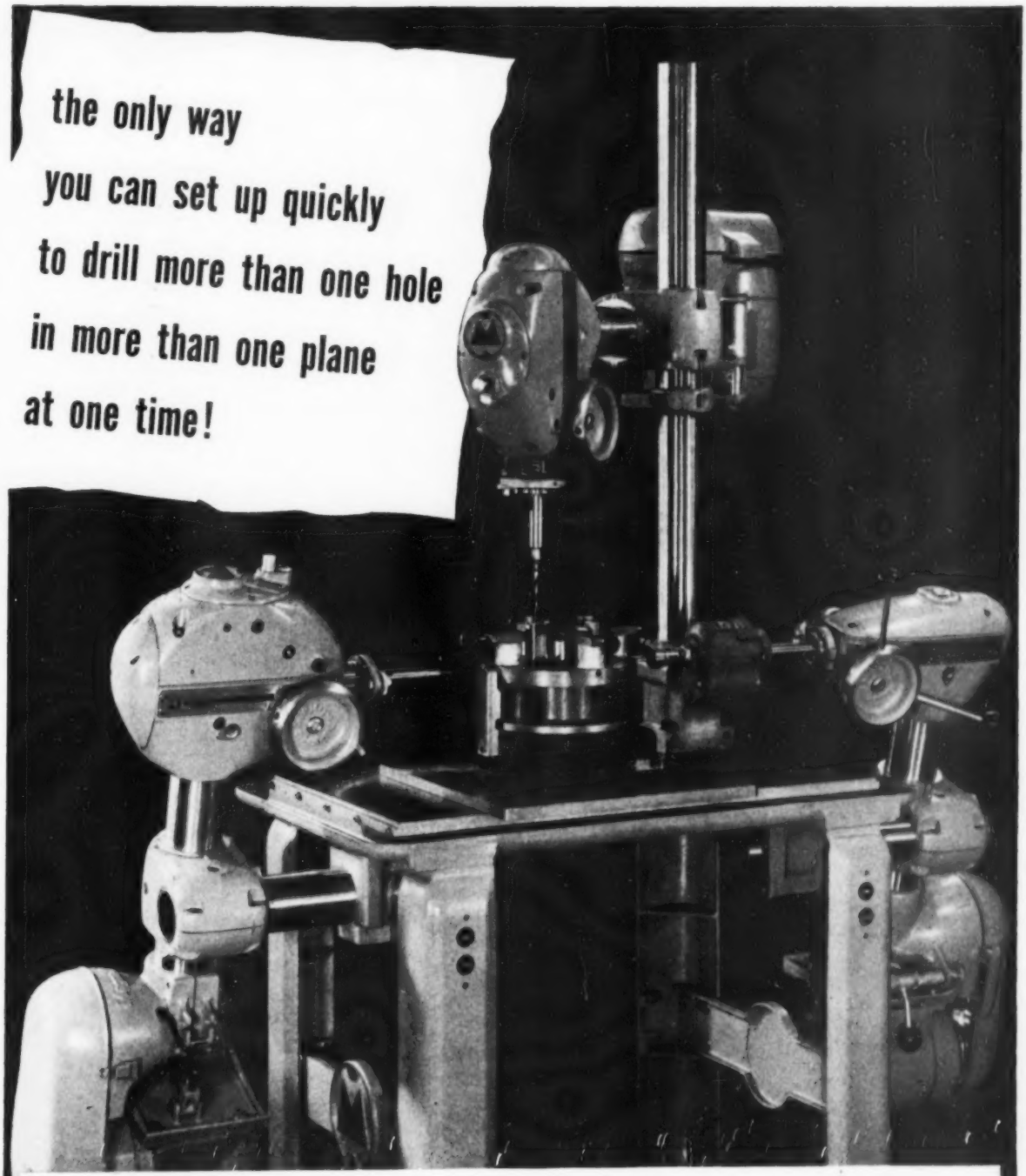
Name _____

Position _____

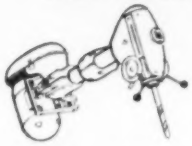
Company _____

Address _____

the only way you can set up quickly to drill more than one hole in more than one plane at one time!



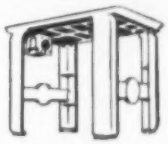
1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



Drill Heads Standardized, adjustable heads can be indexed and locked at any angle or position *without special tools*. Variable throat. Right or left hand feed. **$265*.**

Columns and Bases ⅝" walls. 3½" precision-ground tubes support drill heads. Column bases are cast iron, line bored; can be mounted horizontally or vertically. **$45*.**

Power Feed (mechanical type) Attaches to any MAGNA DRILL head in a few minutes. Solenoid or manual engage; spring return. Can be set for automatic cycling. **$175*.**



Tables Drilled and tapped for mounting heads in variety of positions, and for ganging tables in multiples. Single table, 24" x 20", **$170*.** Double table, 24" x 40", **$220*.**

*DELIVERED TO YOUR PLANT

Get a Load of
these NEW
MORSE
TOOLS

Here's a Brand-New Idea! . . . MORSE Taps and Dies Handsomely Boxed in Basic Sets and Conversion Sets

HERE'S ANOTHER MORSE ORIGINAL . . . these 7 well-chosen assortments of tools and sizes, protectively packaged in sturdy steel boxes with formed-wood inserts. You can buy these basic sets *now*, in either National Coarse Thread or National Fine Thread Series. Then later on, as you find need, you can buy the smaller conversion sets *in the other series* . . . and so complete your basic sets.

This is new convenience and economy in cutting-tool buying . . . a new idea from the main source of *all* really new cutting tool ideas . . . MORSE.

So get your basic Tap and Die Sets *now*, and convert them later, as you need to. Get in touch today with your Morse-Franchised Distributor for full details and prices on this new Morse "package deal".

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NEW BEDFORD, MASS.
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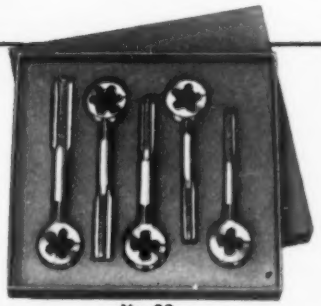
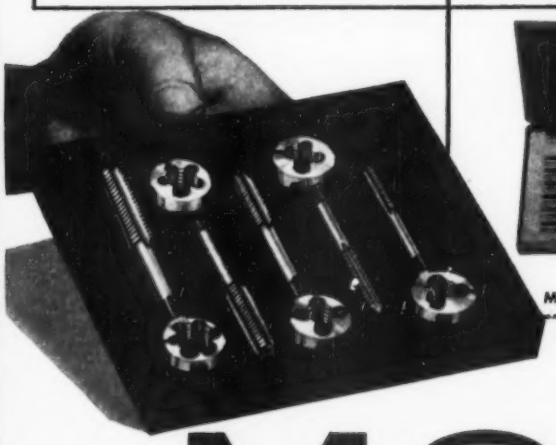
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



No. 93
CONVERSION TAP AND DIE SET

No. 100
MASTER TAP AND DIE SET

No. 101
MASTER TAP AND DIE SET



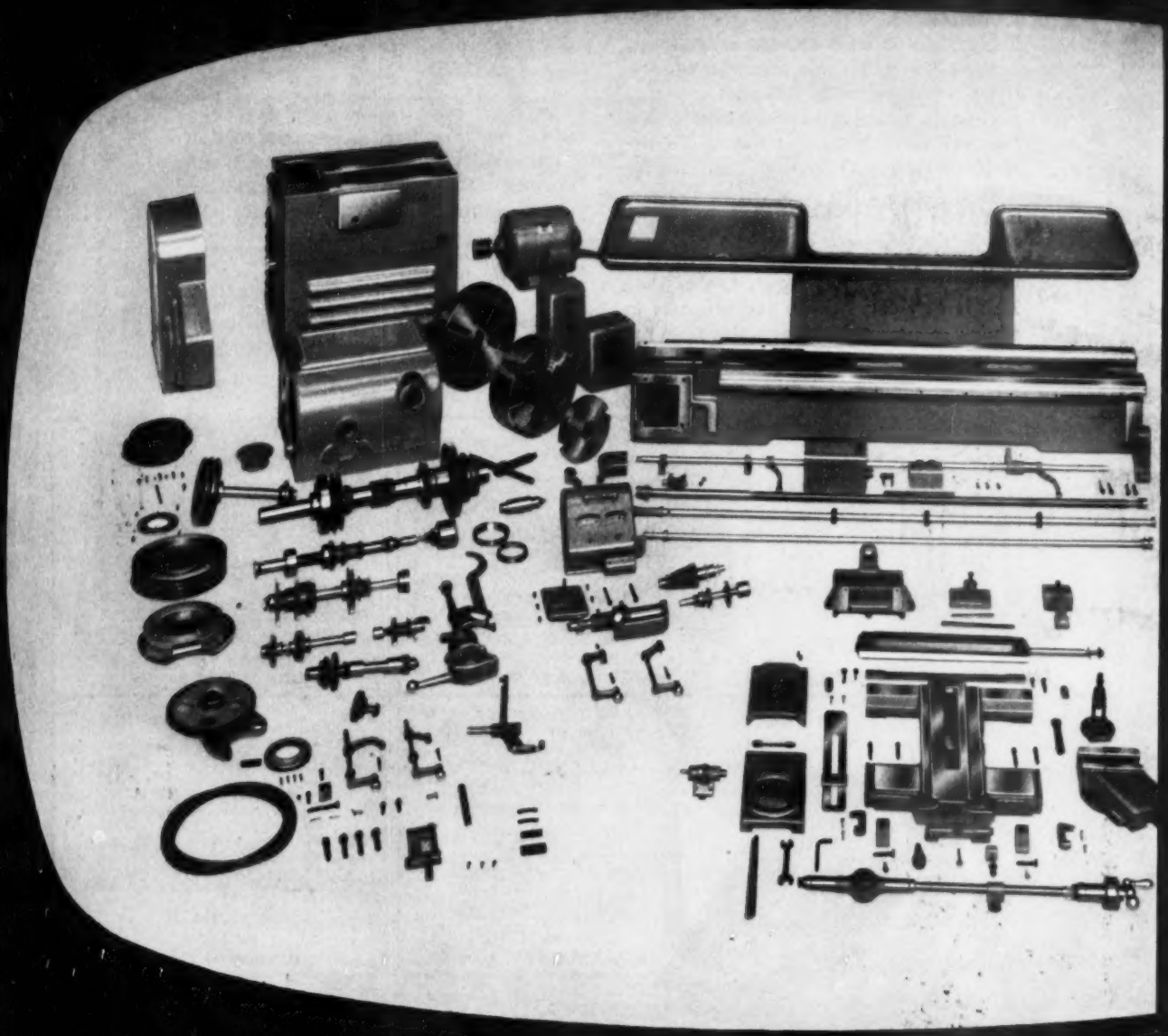
No. 31
MACHINE SCREW TAP & DIE SET

No. 200
HEXAGON
RETHREADING DIE SET

MORSE
Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

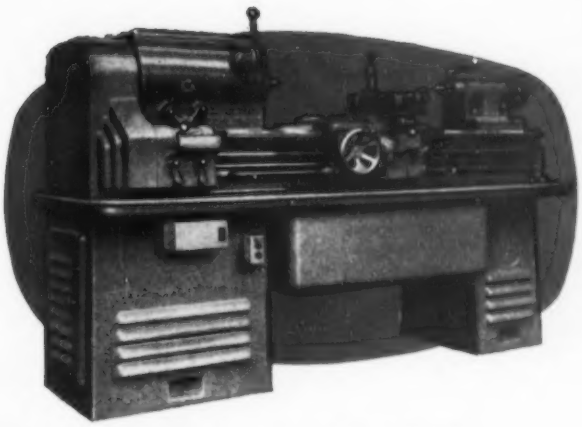
see what makes the

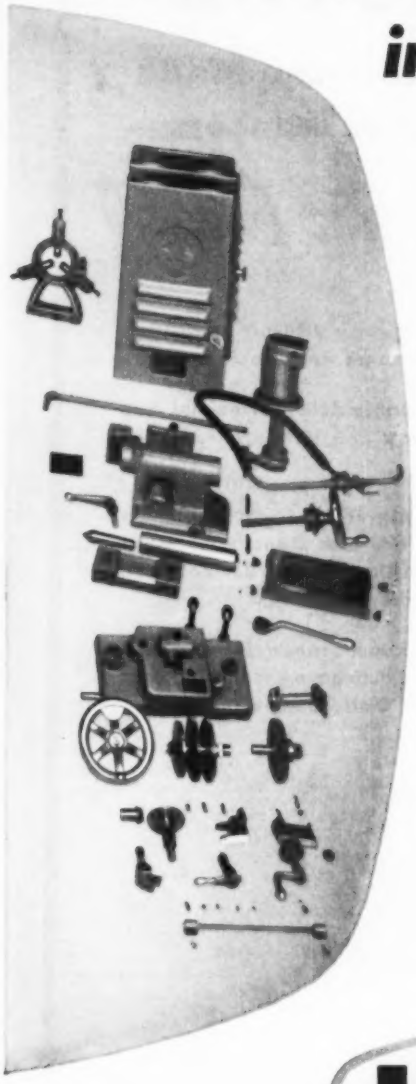


THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Dual-Drive

your best buy in the medium-price field





compare—
part by part, feature by feature...

FULL-POWER SPEEDS

Dual Drive's headstock design combines belt and gear drive to give you the widest range of speeds in its class—*all at full horsepower.* Twelve speeds from 28 to 1800 rpm.

OPTIMUM SIZE

15″ swing to take care of virtually all of your medium-duty turning. 30″ base center distance; more in increments of 12″.

BIG FEED-THREAD RANGE

Ninety-six feeds from .0004″ to .106″.
Forty-eight threads from 4 to 224.

CONVENIENCE

Single-lever speed control. Electric brake, forward and reverse spindle control at apron. Single-lever, positive-jaw feed control. Multiple automatic length stops. Many useful attachments.

ENDURANCE

Totally-enclosed feed box. Automatic lubrication through headstock and feed box. Hardened steel gears and anti-friction bearings. One-piece, double-wall apron. Hardened and ground replaceable steel bed ways. American Standard taper key drive spindle nose.

turned faster by

LeBLOND *of Cincinnati*

Your nearby LeBlond Distributor or the factory will be happy to give you the full story on Dual-Drive. Just ask for Bulletin 4A.

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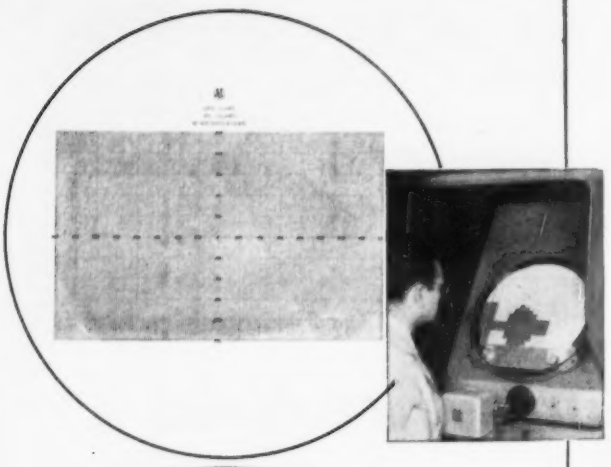

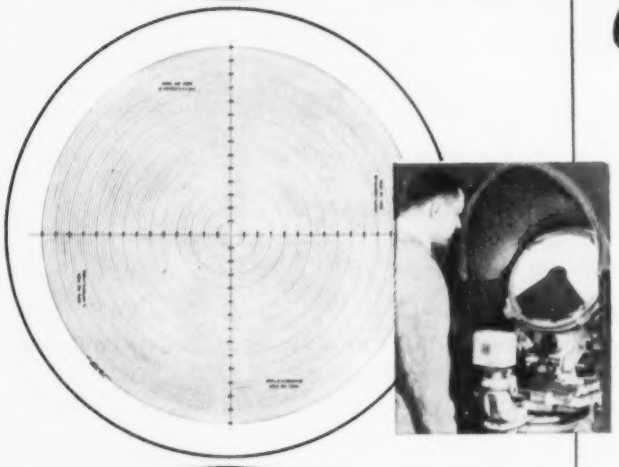

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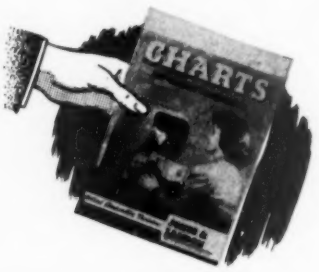

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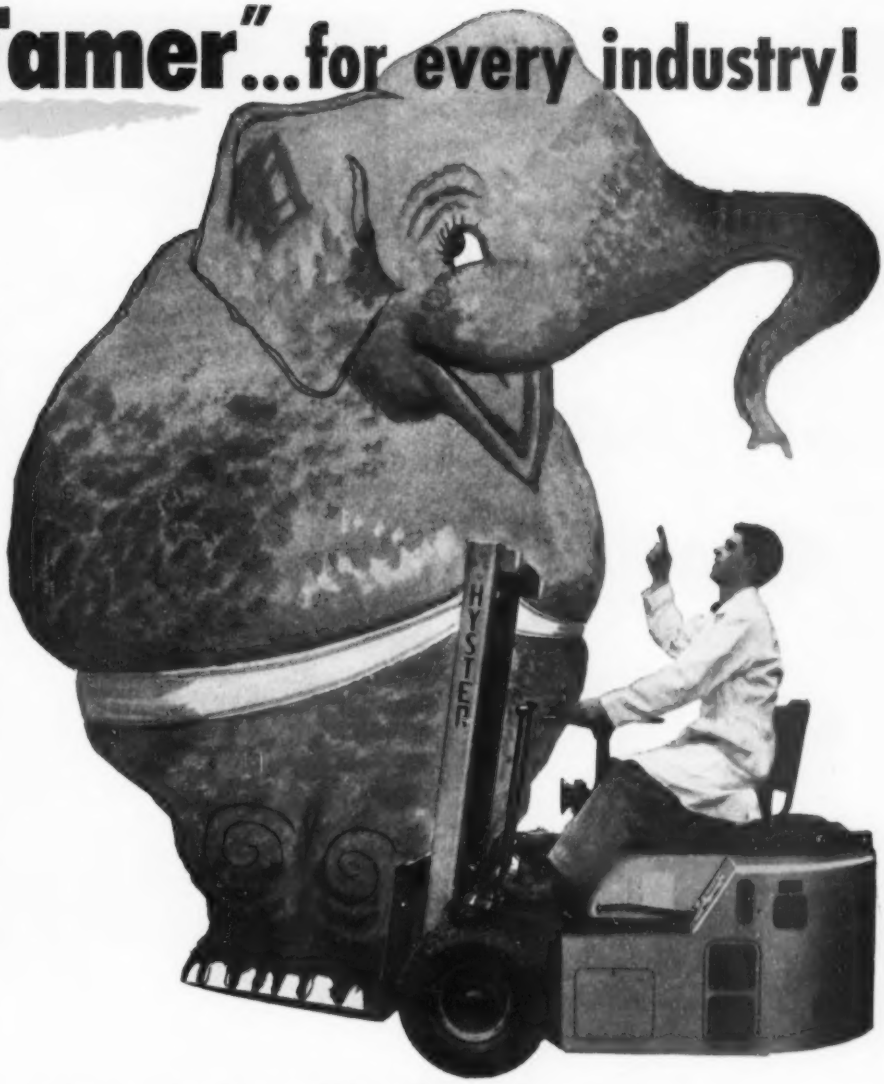
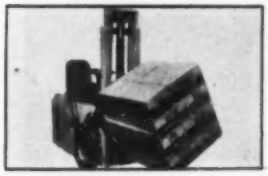
OPTICAL COMPARATOR DIV.

"Ton Tamer"...for every industry!

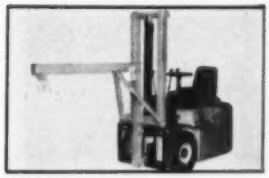


Hyster 20 Attachments "tame" a ton in any form

LOAD GRAB—for bales, barrels

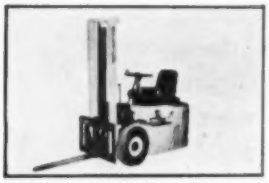


LOAD GRAB—for crates, cartons

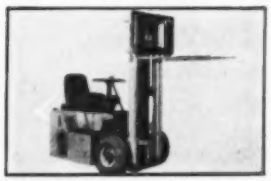


BOOM—for crane work

SCOOP—for loose materials



RAM—for toroidal shapes



FREE LIFT—for stacking under low clearances

If your load weighs 2000 lbs. or less, the HYSTER 20 Lift Truck is the surest way to more profit!

Take a good look *now* at the load *you must* handle more efficiently if you are going to cut costs. Whether it's bales, bags, bricks, bottles, bundles, boxes or barrels, the Hyster 20 can move your ton more profitably than in any other way—as attested by Hyster records in every industry. *The Hyster 20 is more than a lift truck with two forks for pallet work.* With the proper attachment, it can be adapted to "tame" tons of otherwise hard-to-handle materials. The Hyster 20 is the best materials handling capital investment you'll ever make because it is easier to maintain—and stays young for years. Write today for Catalogs 1198-C and 1206 to Hyster Company, 2902-14 N. E. Clackamas, Portland 8, Oregon.

THERE'S PROFIT IN HYSTER LIFT AND PULL

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Be sure to call HYSTER before you buy any LIFT TRUCK

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38 Years' Experience

in metal surface treatment to you

FIRST in the field since 1915

● Only Parker has it! Experience gained in planning metal surface treatments in thousands of plants. Experience matured in meeting and solving problems of installation, application and performance day after day for 38 years. Experience enriched by a continuing research program of improvement and discovery.

In the Parker man's briefcase — and in the knowledge and skill of production, engineering, research, and testing staffs which back him up — are the answers that will mean savings and satisfaction for you when you need a metal surface treatment in your plant.

For rust control, paint base, wear resistance, metal cleaners, aids for drawing and cold extrusion, call in the man whose briefcase is packed with 38 years of success. Call Parker!

**Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.*

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RUST PROOF COMPANY
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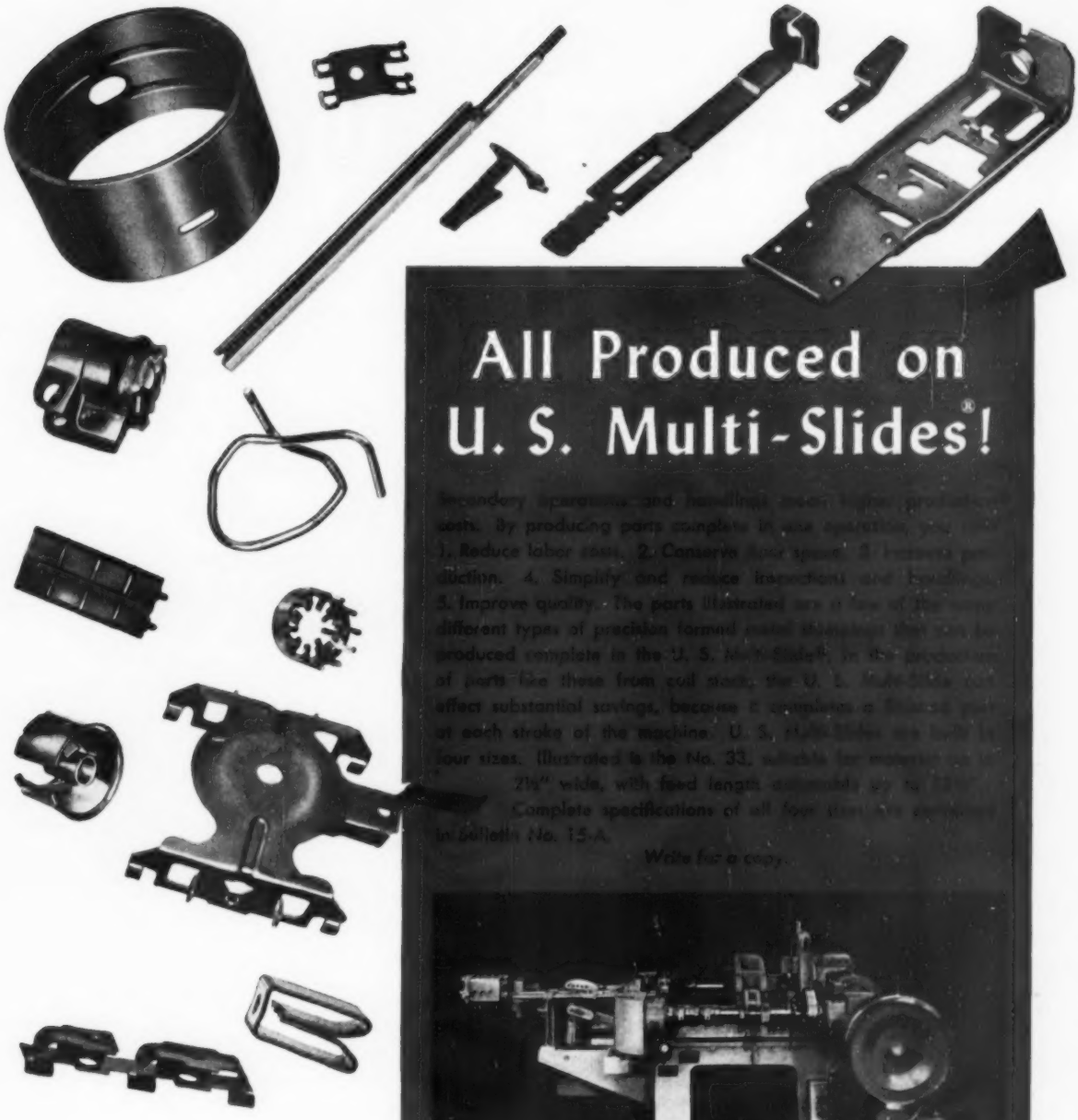
BONDERITE—corrosion resistant paint base

BONDERITE AND BONDERLUBE aids in cold forming of metals

PARCO COMPOUND rust resistant

PARCO LUBRITE—wear resistant for friction surfaces



All Produced on U. S. Multi-Slides®!

Secondary operations and handling costs higher production costs. By producing parts complete in one operation, you: 1. Reduce labor costs. 2. Conserve floor space. 3. Increase production. 4. Simplify and reduce inspection and handling. 5. Improve quality. The parts illustrated are a few of the many different types of precision formed metal stampings that can be produced complete in the U. S. Multi-Slide®. In the production of parts like these from coil stock, the U. S. Multi-Slide will effect substantial savings, because it completes a finished part at each stroke of the machine. U. S. Multi-Slides are built in four sizes. Illustrated is the No. 33, suitable for material 2½" wide, with feed length adjustable up to 12".

Complete specifications of all four sizes are contained in Bulletin No. 15-A.

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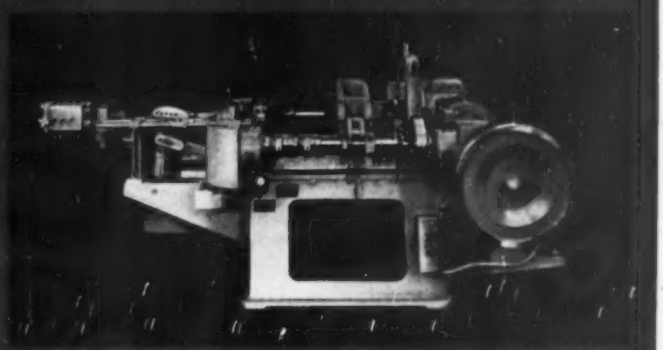

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US PRODUCTS

U. S. TOOL COMPANY, Inc.

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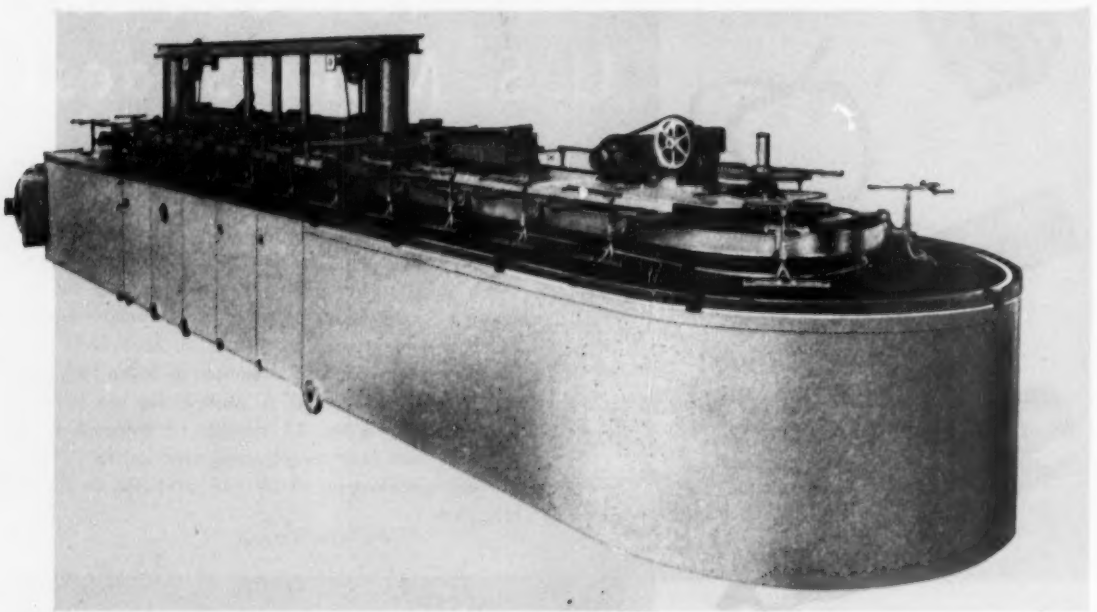
Builders of U. S. Multi-Slides® U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

CROWN TYPE "C" AUTOMATIC

for plating and cleaning . . .



STREAMLINE your plating operations — get a better quality of work at lower cost by installing Crown automatic equipment. You'll benefit immediately by a better control of production schedules — uniformity of plating — elimination of human variables and a reduction in plating costs.

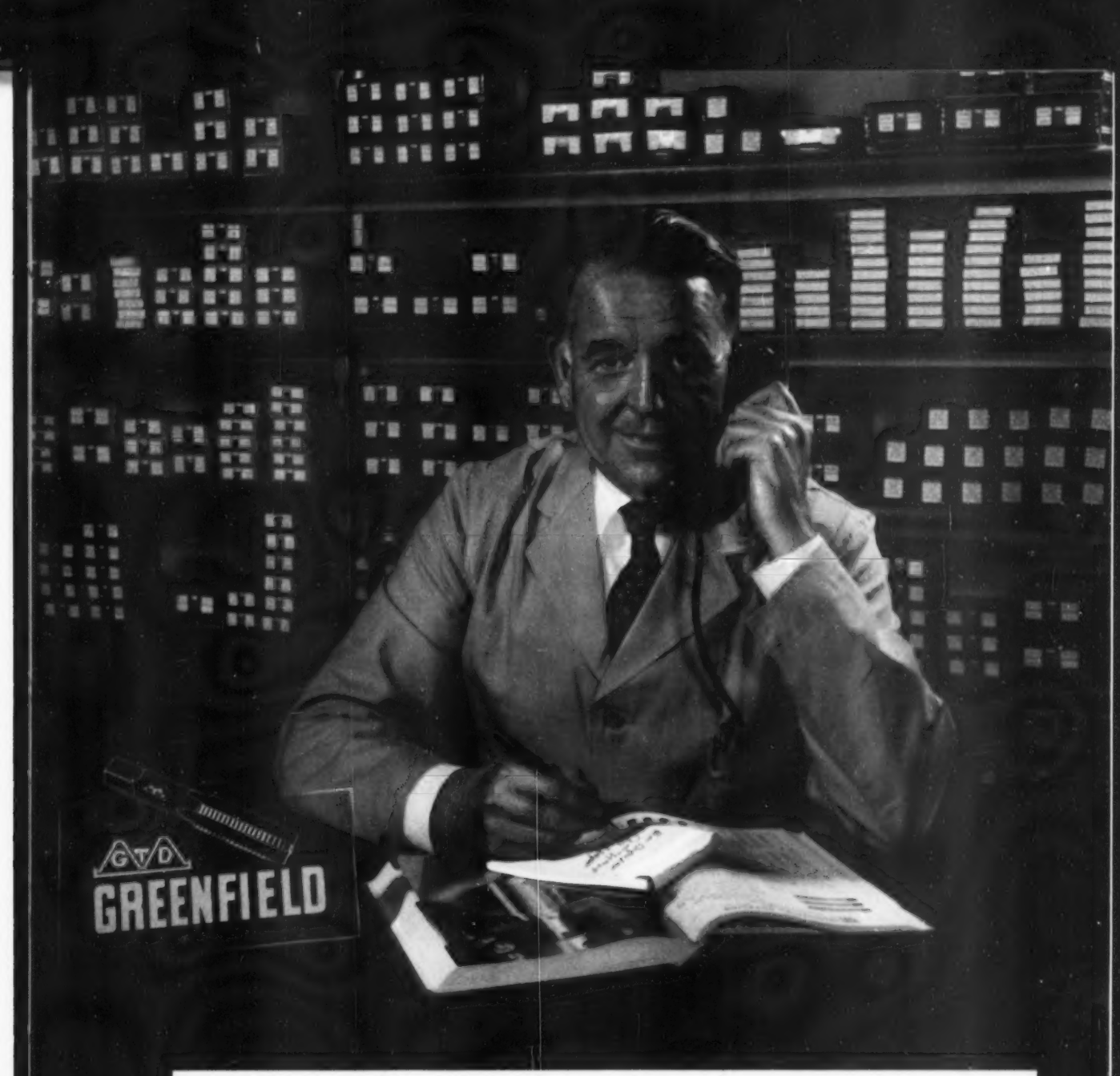
Investigate the possibilities of Crown automatic equipment for your plating operation — give us details of your requirements for additional information.

TYPE "C" MACHINE — (up to 50 ft. lengths) can be shipped in operating order as per following specifications:

1. Two Units on standard transport trucks.
2. Maximum shipping dimensions per unit 26′ long x 6½′ wide x 7½′ high. (Above units will go through most plant doors and aisleways.)
3. Tanks 42″ deep.
4. Maximum effective area of racks 28″ long x 18″ wide.
5. Maximum treatment for given floor space.
6. High speed vertical agitation (up to 18 ft. per minute can be built into machine.)

CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS



"YES...WE'VE GOT THOSE TAPS IN STOCK"

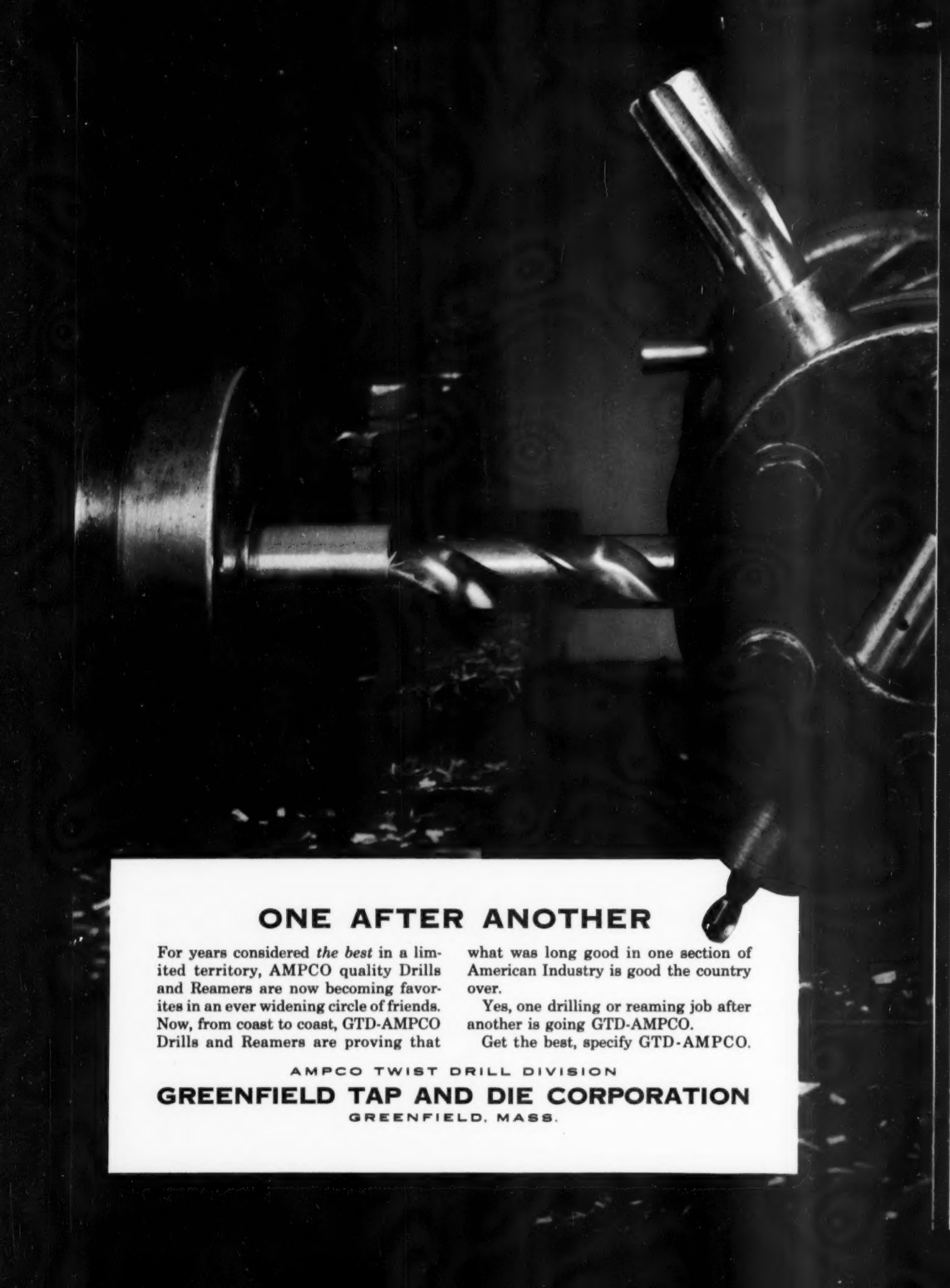
That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distributor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around . . . stop buying the hard way.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.



ONE AFTER ANOTHER

For years considered *the best* in a limited territory, AMPCO quality Drills and Reamers are now becoming favorites in an ever widening circle of friends. Now, from coast to coast, GTD-AMPCO Drills and Reamers are proving that what was long good in one section of American Industry is good the country over.

Yes, one drilling or reaming job after another is going GTD-AMPCO.

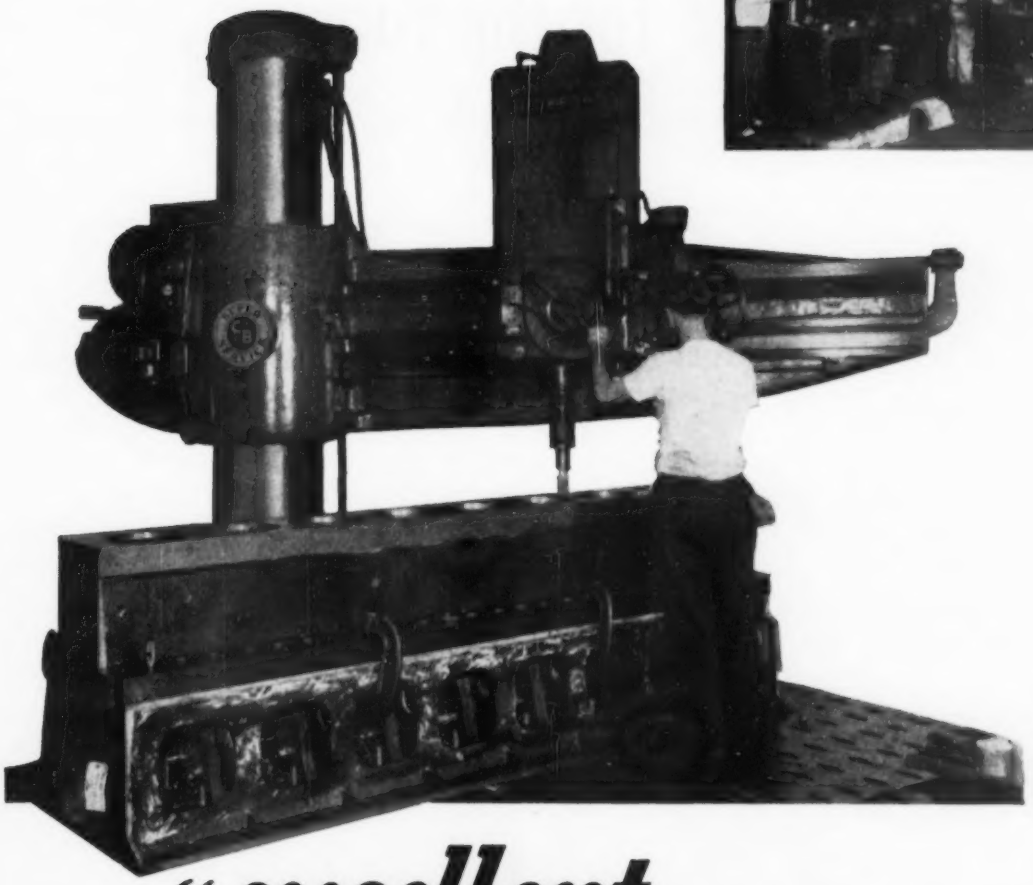
Get the best, specify GTD-AMPCO.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

This battery of Cincinnati Bickford Super Service Radial Drills is drilling, tapping and reaming smaller parts.



"excellent in all respects..."

The ease of handling, the performance, accuracy and speed of the 7' arm, 19" diameter column Cincinnati Bickford Super Service Radial Drills "rated excellent in all respects."

The job involved drilling, tapping, reaming of 43 holes in a large diesel cylinder block.

A battery of smaller Cincinnati Bickford Super Service Radial Drills is also giving "excellent" performance.

Write for descriptive circular of these fine machines.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Come what may...your plant is prepared for the future...

when it's equipped with versatile LAKE ERIE *hydraulic presses*

Norris-Thermador Corp. provides another excellent example

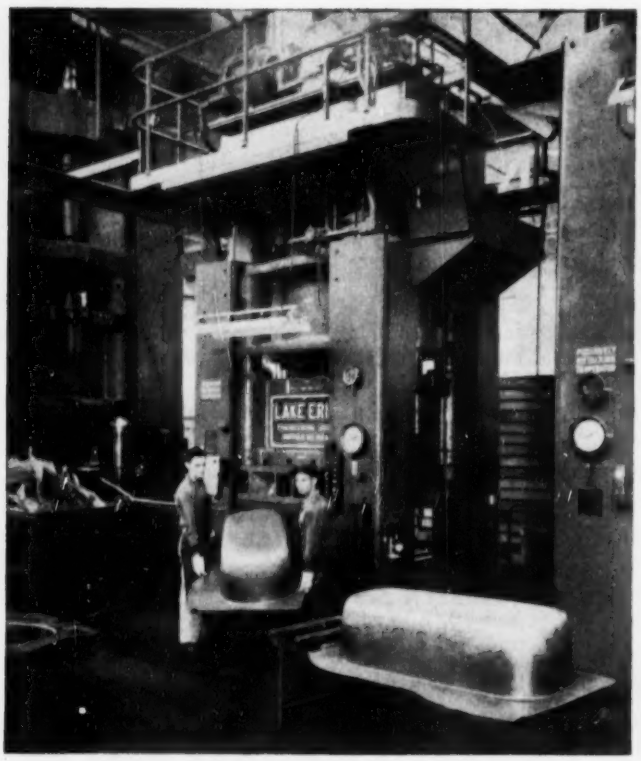
YESTERDAY...
it was bathtubs

TODAY...
it's shell casings

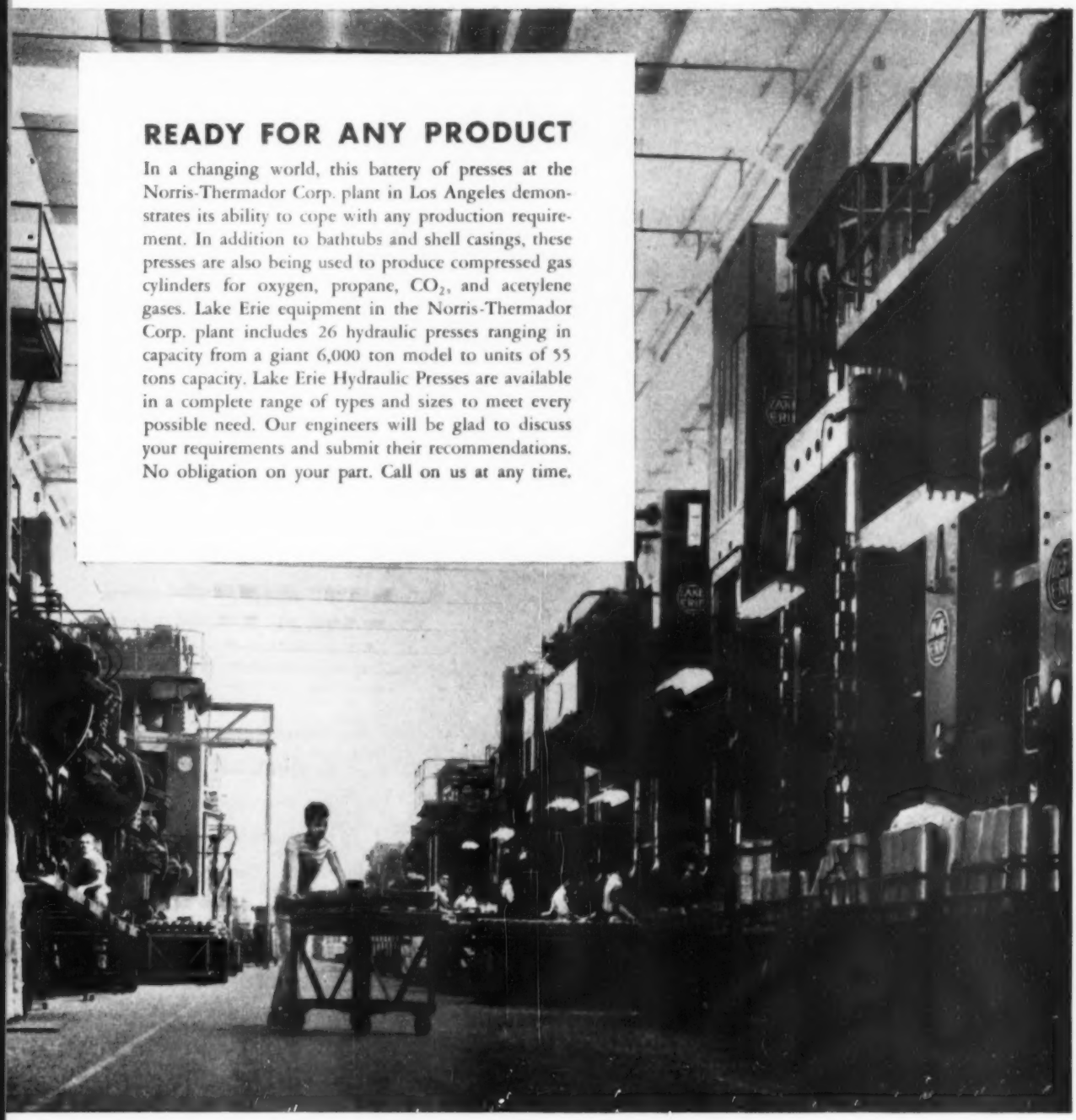
TOMORROW...
it may be another metal product

BUT...
these hydraulic presses will be ready for it.

Plant versatility is a mighty important asset... particularly today when products and markets are so prone to change on such short notice. When this versatility is coupled with high production efficiency, as it is with the fast Lake Erie hydraulic presses available today, your plant is equipped to return maximum yield on your investment. No matter what change-over you encounter—military to civilian, or vice versa... a model switch... the introduction of a new product...versatile and efficient Lake Erie Hydraulic Presses will enable you to make the change with a minimum of money, time and retooling. Why not investigate these advantages of Lake Erie Hydraulic Presses? Write or call us. No obligation.



● One of 26 Lake Erie Hydraulic Presses in the Norris-Thermador Corp. plant demonstrates its remarkable versatility. At left—drawing bathtubs, right—heading 105 mm. shell casings.



READY FOR ANY PRODUCT

In a changing world, this battery of presses at the Norris-Thermador Corp. plant in Los Angeles demonstrates its ability to cope with any production requirement. In addition to bathtubs and shell casings, these presses are also being used to produce compressed gas cylinders for oxygen, propane, CO_2, and acetylene gases. Lake Erie equipment in the Norris-Thermador Corp. plant includes 26 hydraulic presses ranging in capacity from a giant 6,000 ton model to units of 55 tons capacity. Lake Erie Hydraulic Presses are available in a complete range of types and sizes to meet every possible need. Our engineers will be glad to discuss your requirements and submit their recommendations. No obligation on your part. Call on us at any time.

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MANUFACTURERS OF HYDRAULIC PRESSES AND DIE CASTING MACHINES

General Offices and Plant
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LAKE ERIE HYDRAULIC PRESSES are available in any size . . . standard, modified and special designs—horizontal and vertical types—for Metal Working—Plastics Molding—Forging—Metal Extrusion—Processing—Vulcanizing—Laminating—Stereotype Molding—Die Casting—Briquetting—Baling—Special Purpose.

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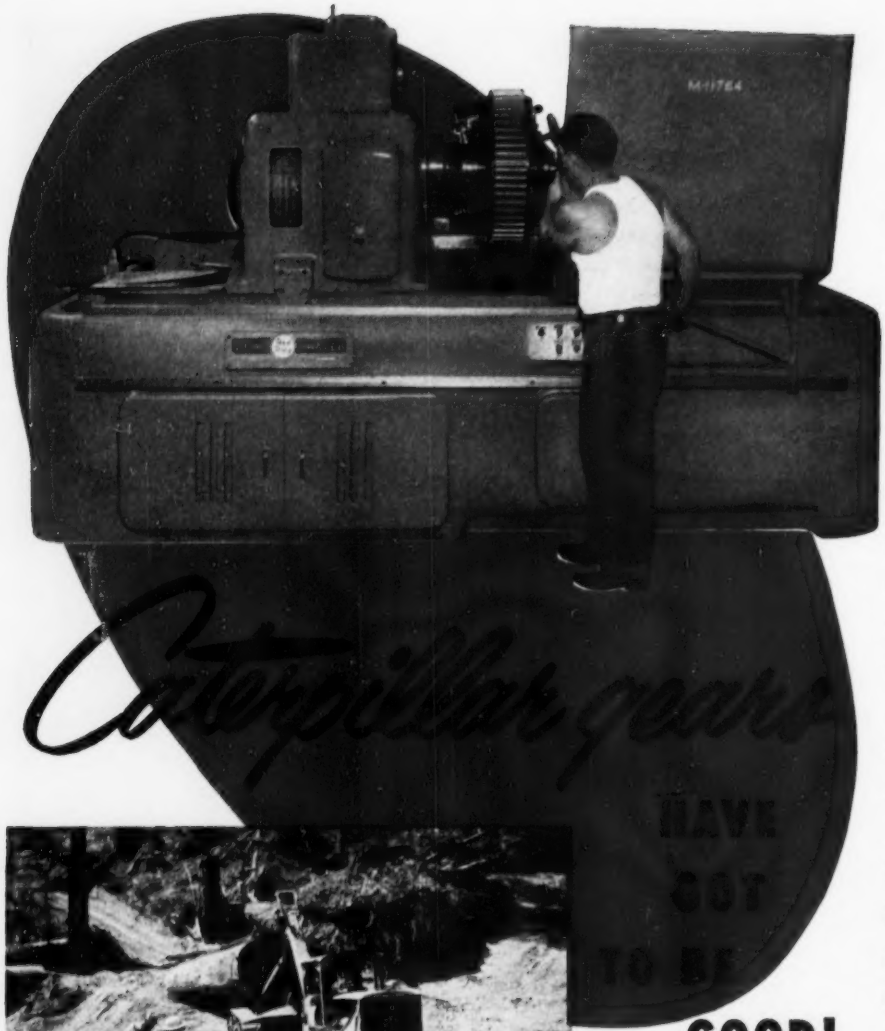
Manufactured in Canada by: Canada Iron Foundries Limited

LAKE ERIE ®



● The unpredictable nature of tractor service, its frequent and unavoidable severity, leave no alternative to gear specifications of the most rigid character including close dimensional tolerances.

Furthermore in order to attain maximum gear service life and avoid critical "end bearing" due to slight changes in alignment under sudden overloads, the drive gear teeth are shaved to the Elliptoid (crowned) Form.

In a recently published article on Caterpillar gear production, reference was made to gear shaving as an important factor in production economy. "Shaving not only controls dimensional characteristics of our gears, correcting gear-cutting errors and producing quiet running tooth surfaces, but also eliminates final lapping operations which were essential before shaving was adopted."

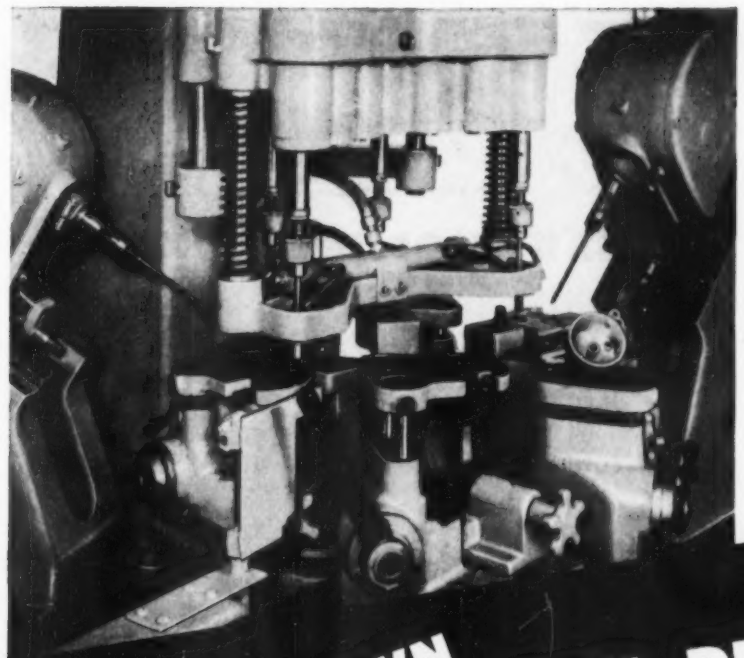
If you have to meet rigid gear specifications investigate Red Ring Gear Shaving. It delivers Precision with Economy.

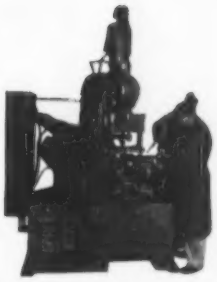
6144

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

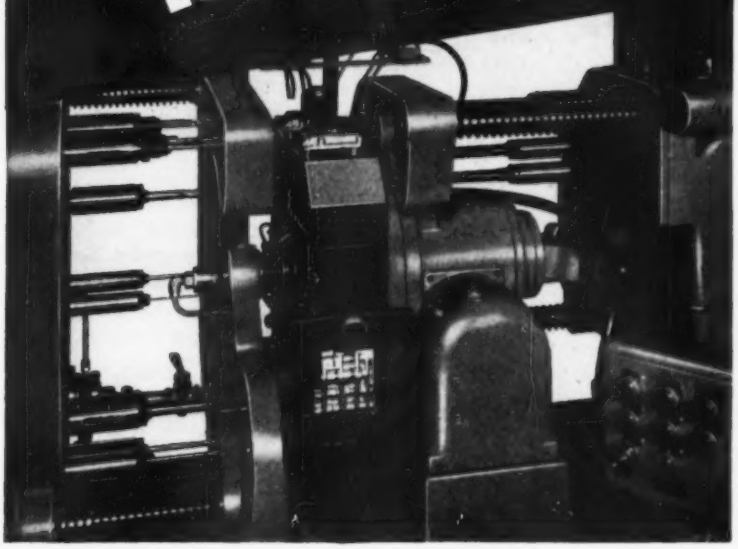
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

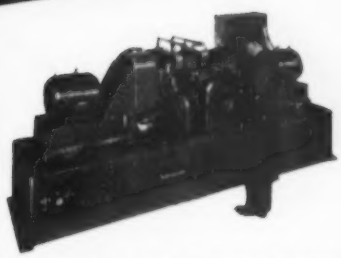




Closeup at the left shows a six station Hartford Automatic single purpose machine rough and finish reaming two cored holes, plus drilling two holes at different angles in die cast aluminum housings.

The LOWDOWN on HIGH PRODUCTION





This view shows a four station Hartford vertical dial type machine drilling, coredrilling and counterboring five holes in aluminum valve bodies.

Hartford Special is ready to design and build a special purpose drilling and tapping machine to boost your production, too. Why not write for more information.

When it comes to production —

HARTFORD *Special*

SUPER-SPACERS

Automatic THREAD ROLLERS

THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.

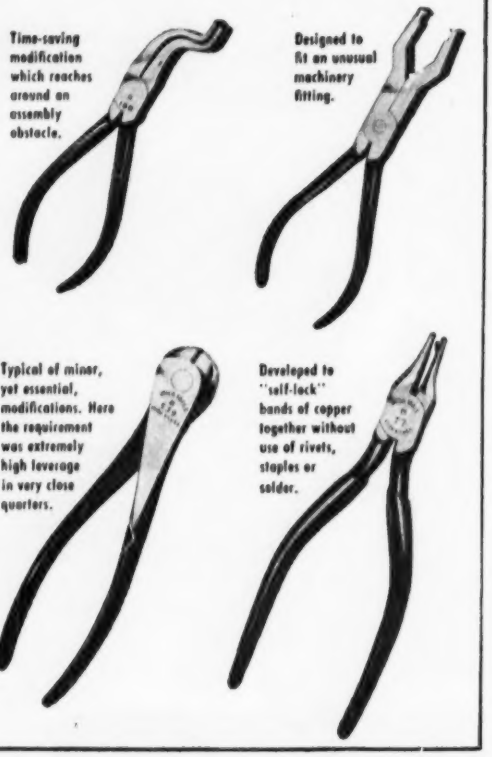
UTICA

IS SPEEDING THOUSANDS OF JOBS WITH

CUSTOM PLIERS

Custom Tools Like These

simplify the unusual,
solve the difficult,
and speed the slow-moving.



Time-saving modification which reaches around an assembly obstacle.

Designed to fit an unusual machinery fitting.

Typical of minor, yet essential, modifications. Here the requirement was extremely high leverage in very close quarters.

Developed to "self-lock" bands of copper together without use of rivets, staples or solder.

Save a few seconds a ***thousand times*** on the production line — and that means real money!

Here in a nutshell is the case for custom tools by UTICA, manufacturer of the world's longest line of pliers.

Let us take over the problem. Let us send one of our sales engineers to check your production line for time-saving possibilities. Custom tools can ***speed, simplify,*** or ***eliminate*** an operation. Such a survey would be without obligation to you, of course.

NO ONE IS SO WELL QUALIFIED TO SOLVE YOUR SPECIAL PROBLEM AS UTICA

Address inquiries to CUSTOM TOOL DEPARTMENT

It pays to use quality tools — U TI CA® — and the world's best tools are made in U.S.A.

DROP FORGE AND TOOL
CORPORATION

UTICA 4, NEW YORK

In Canada
ADLAM TOOL & SUPPLY CO., LTD., MONTREAL;
WALLS-IRONS, LTD., WINNIPEG

self-locking fasteners

Elastic Stop nuts

HEX NUT

SPLINE NUT

HIGH TENSILE NUT

CLINCH NUT

1200° F. HIGH-TEMP. NUT

GANG CHANNEL NUTS

FLOATING ANCHOR NUT

Every major aircraft now being assembled relies on the vibration-proof holding power of ELASTIC STOP nuts. Only ESNA manufactures a complete line of all types and sizes of self-locking nuts.

Rollpins

dia. from 1/16" to 1/2"

Rollpins are slotted, tubular steel, pressed-fit pins with chamfered ends. They drive easily into holes drilled to normal tolerances, compressing as driven. Extra assembly steps like hole reaming or peening are eliminated. Rollpins *lock* in place, yet are readily removed with a punch and may be reused.

Cut assembly costs by using Rollpins as set screws, positioning dowels, clevis or hinge pins. Specify them in place of straight, serrated, tapered or cotter type pins.

ESNA TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

ROLLPIN TRADEMARK

Mail Coupon for Design information

Elastic Stop Nut Corporation of America
Dept. N34-29, 2330 Vauxhall Road, Union, N. J.

Please send me the following free fastening information:

- ☐ Elastic Stop Nut Bulletin
- ☐ Rollpin Bulletin
- ☐ AN-ESNA Conversion Chart
- ☐ Here is a drawing of our product. What fastener would you suggest?

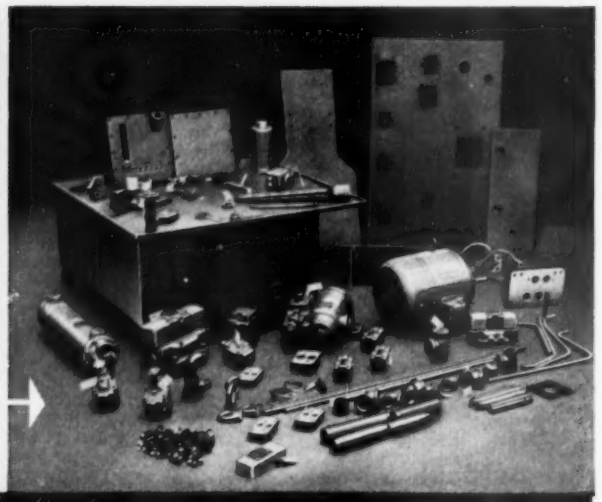
Name_____ Title_____

Firm_____

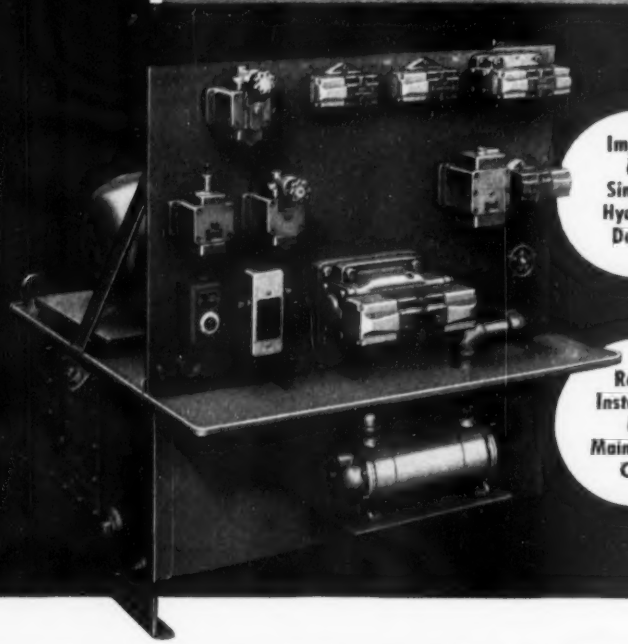
Street_____

City_____ Zone____ State_____

It Takes MORE than a Collection of Parts



To Make A VICKERS CUSTOM BUILT POWER UNIT



Improve and Simplify Hydraulic Design

Reduce Installation and Maintenance Costs

A Vickers Custom Built Power Unit is much more than a collection of parts . . . just as the machines you build are more than the castings, shafting, gears, motors, etc. that go into them.

The Vickers Unit is designed and built with the "know-how" obtained during more than a quarter century of experience in practically every kind of hydraulic operation, plus a thorough understanding of your needs. It is built exactly to your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., are in one compact and self-contained "package". It includes all needed hydraulic accessories such as oil filters, air cleaners, oil level gauges, fittings, etc. Hydraulic connections may be grouped in a conveniently located manifold.

The result is simplification of hydraulic design and important savings in installation and maintenance costs. Vickers undivided responsibility for the entire hydraulic control system is another important advantage to both the machine builder and his customer. • Write for new Bulletin 52-45.

VICKERS Incorporated
DIVISION OF THE SPERRY CORPORATION
1410 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices:
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ROCHESTER • ROCKFORD • SEATTLE • TULSA
WASHINGTON • WORCESTER

6053

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

MODERN PRECISION TOOLS

MODERN COLLAPSIBLE TAPS

Modern Self-Opening Die Heads are available in both stationary and rotary types. The stationary type is made in a range of sizes with capacity for cutting straight threads from 1/8" to 7", and 1/8" to 6" for pipe threads.

MODERN SELF-OPENING DIE HEADS

Of unusually simple design with a minimum number of parts and no complicated mechanisms, this new Modern Collapsible Tap Style A-A helps meet industry's demand for faster, lower cost production. It is made in a wide range of sizes with adequate capacities for cutting straight threads and straight and taper pipe threads. All parts are of properly hardened steel, ground and precision fitted.

MODERN-MAGIC CHUCKS AND COLLET EQUIPMENT

Modern-Magic Quick Change Chuck and Collet Equipment virtually eliminates costly idle time usually present in revolving spindle operations. Tools are changed without stopping or even slowing the spindles. Modern-Magic Chucks are made in 6 sizes and two types: friction drive and positive drive. Modern-Magic Collets are available in a broad range of both standard and special types.

Modern Self-Opening Stud Setters are positive and entirely automatic in action, and can be operated in any position with either air or electrically driven portable tools. Also equally effective in drill presses where it is possible to drill and tap the holes and set the studs in successive operations. Made in two sizes 1/2" and 7/8" capacity.

Modern Medium Duty Face Milling Cutters are of blade backed design, and are made in axial and radial types. Standard Modern axial type cutters are available in diameters from 4" to 24". Standard radial type cutters from 8" to 24" diameters. All blades, wedges and screws are interchangeable in all Modern Cutters regardless of diameters.

Detailed information covering any Modern Precision Tool in which you are interested will be furnished promptly upon request. Let us show you how Modern Precision Tools can help to speed up your production and reduce your costs.

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

MODERN SELF-OPENING STUD SETTERS

MODERN FACE MILLING CUTTERS

Modern Precision Tools are produced by the originators of the Modern-Magic Quick Change Chuck and Collet Equipment.

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

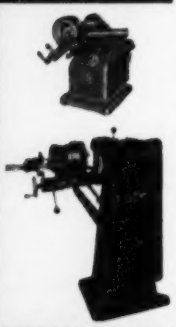
SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.



As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼ to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model 5-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15"; also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten-Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Orchids to NTDMA

We are interested in obtaining the use of the sound-color movie which the National Tool & Die Manufacturers' Ass'n has produced, and which was announced in your magazine (*AM*—Jan 5 '53, p159).

As we are subscribers to *AM*, would you please give us all the assistance you can in getting the loan of this film?

My compliments to NTDMA for having the courage to stand on its own two feet. It is time that all trade associations followed this procedure.

Raymond L W Benoit
Director, Cole Trade High School
Southbridge, Mass

If you will write to Mr George Eaton, Executive Secretary, National Tool and Die Manufacturers' Ass'n, 906 Public Square Bldg, Cleveland 13, Ohio, he will be delighted to see that you get the film, "The Tool & Die Worker — America's Modern Frontiersman" for a showing in your school.—Ed.

Safety Savings

In an article published some time ago (*AM*—Sept 22, '49, p107) you stated a constant approximately as follows: "A 10% reduction in figuring of lost-time accidents, if sustained annually, results in a savings of $1250 per 100 employees in an industry."

We are interested in the specific application which can be made in using the constant. For example, is it correct to compare the frequency for the year 1946 to the respective frequency for years 1947 through 1952, in order to determine how much saving had been made in that period of years? Would it be possible for you to inform us how the constant was determined?

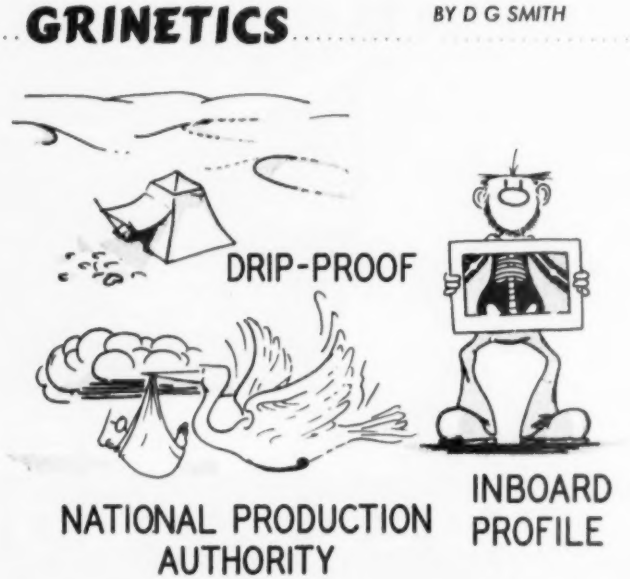
You are, no doubt, well aware of the fact that general information on the value of an accident prevention program is available, yet specific figures or constants for measuring performance are seldom to be had. We certainly would appreciate whatever information you can furnish us in regard to the above items.

L K Bodenhamer
Ass't Safety Engineer
General Electric Co, Fort Wayne

The statement read, "A 10% reduc-

GRINETICS

BY D G SMITH



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STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Soluble Oil

TOOL Precision grinder

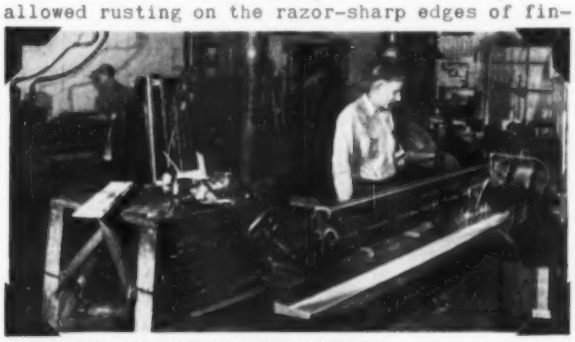
LUBRICATOR Circulating flow onto work

SERVICE Grinding paper-cutting knives

FIRM Sharpe & Company, Los Angeles

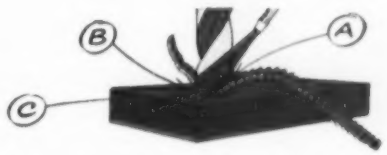
Highly stable oil ends separation and rust problem!

CALOL SOLUBLE OIL was the answer to many problems on this precision grinder, used by Sharpe & Co., Los Angeles, for sharpening paper-cutting knives. Other oils tried turned rancid, separated in storage, and allowed rusting on the razor-sharp edges of finished blades. But when a mixture of only one part Calol Soluble Oil to 63 parts water was used, it remained stable under all conditions, prevented rusting, and held deposits on grinding wheel to a minimum. (Above) Hand-honing blade after grinding.



SHARPENING HARD TOOL-STEEL KNIVES for paper-cutting machines all over the West, Sharpe & Co. has used Calol Soluble Oil for more than three years. Owner Eldon Buntin says, "We have had no trouble of any kind since using Calol Soluble Oil. It doesn't separate or permit rusting like other oils we've tried and has never produced a bad odor."

How to up efficiency in all metal-cutting operations



Use the correct Calol Cutting Fluid for any operation from grinding to broaching. Recommendations for each are made from actual working results.

A. Have high cooling and lubricating qualities—minimize "built-up edge" and promote good finish.

B. Flush away cuttings readily.

C. Protect machine and work against rusting and corrosion.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

taps won't break...

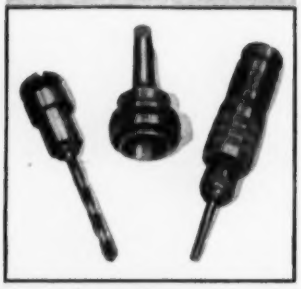
...Wickman Combination Tapping Attachment

- Applies Safe Torques ALWAYS
- Saves Taps, Labor, Materials

Here's an effective remedy for tapping headaches—a positive, safe tapping attachment with an entirely new clutch principle. This tapper guarantees your taps against breakage because it replaces coiled springs with a resilient material 100 times more effective than steel.

The Wickman Combination Tapper safeguards taps even in blind hole tapping; high resiliency of the pressure unit permits the clutch to slip the instant the tap strikes bottom or a hard spot. And, it's simple, too! Definite torque settings for given taps and tap sizes, without regard to materials being tapped, can be changed instantly without tools.

Wickman Tappers can be used on all reversible machines for horizontal or vertical tapping, blind or through holes. Three sizes are available: T-1, ½"-1¾" USS; T-2, ⅜"-1¼" USS; T-3, ⅜₁₆"-½" USF.



NOW—IMPROVED DESIGN GIVES NEW VERSATILITY, FASTER CHANGE-OVER

New features on improved model include a new detachable tapper shank holder with quick change lock for tapper or drill adapter. Change-over from tapping to drilling, counterboring, reaming etc. is made in a few seconds. No tools necessary. Send for free bulletin for full details.

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE OAK PARK, DETROIT 37, MICHIGAN

tion in the frequency of accidents, in the average plant, means a saving of $1250 per year for each 100 employees." Our source for the statement was the Safety Bureau of the Metropolitan Life Insurance Co. They, in turn, got it from the National Conservation Bureau. We do not know how the constant was originally determined.

If we accept the constant as correct, it could be applied only in relation to the average industry-accident frequency. If a plant started with a frequency only half of the industry average and achieved a 10% reduction, this would be an equivalent of 5% in terms of the industry average, and would constitute a smaller saving than a plant that started with a higher frequency and then made a 10% reduction.

It is our opinion that the figure of $1250 is too low today. Rising costs of compensation, etc, have undoubtedly increased it. Our guess would be that it is up at least 20%, and probably more.

The questions you raise are extremely interesting ones and we are sorry we cannot give you more explicit answers. Perhaps later this year we can look into the matter further and see what can be found. Further information should be generally useful and would make a good article—Ed.

Alma Mater

Your story, "Tool and Die Film Will Stress Work Dignity" (*AM*—Jan 5 '53, p159) prompts this letter. This film will fill a definite need, and we should be obliged if you would advise us where to address a request for it. We are interested in having it long enough to circulate through the schools of St Paul that are feeders to our vocational trade school. The St Paul Board of Education maintains a visual-aid film service, and the copy could be handled from that office. For what period of time

could the film be placed on deposit here?

I include some facts which I hope will disprove some of the conclusions arrived at in the NTDMA panel discussion, as far as this vocational trade school is concerned. We are envious of our reputation in this area.

1) 100% of our graduates are satisfactorily placed in industry.

2) Our Twin Cities industries look to this school for beginning craftsmen in the tool and die trades, e.g., Minneapolis Honeywell, Minnesota Mining & Mfg, Minnesota Plastics, Northern Pump, Auto Engine Works, and a host of other plants.

3) Our shop facilities for tool and die training are the best, and include all types of machine tools, two plastic molding machines, heat-treating equipment, and precision measuring equipment. We have added new equipment to the value of more than $17,000 from 1949 to 1952 inclusive.

4) Our instructor in tool and die making commands the respect of local craftsmen and the industry in this area, and students from our school have won the Outstanding Achievement Award for the last three consecutive years in the Ford Motor Co nation-wide contest.

A C Taylor, principal
St Paul Vocational School
St Paul, Minn

You can arrange to borrow the film "The Tool & Die Worker—America's Modern Frontiersman" by writing to Geo Eaton, Secretary, National Tool & Die Manufacturers' Ass'n, 906 Public Square Bldg, Cleveland 13, Ohio.

We have not discussed the matter with him, but have little doubt that arrangements can be made for a period long enough to cover your entire school system.

The facts you present about your school are extremely interesting and reflect great credit to all concerned with it.—Ed.

with *Gorham*-ENGINEERED SPECIAL CUTTING TOOLS

Next time you're up against a tough tooling problem, call in the man who can give you *the right answers fast* . . . your nearby Gorham Field Engineer! He's an expert in special cutting tools . . . and he's ready to provide a complete engineering service to determine your exact tooling requirements. He starts with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and desired finishes and tolerances. He plots proper machine feed, speed and method of tool driving. Then he develops practical design and engineering specifications for special cutting tools, metallurgically "tailor-made" for your application.

His recommendations are backed by Gorham's unmatched facilities, which include three fully-equipped modern plants, a large Engineering and Metallurgical staff, and a force of field application engineers in principal industrial centers, coast-to-coast. All are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?* If you haven't met your nearby Gorham Field Engineer, write for his name, or send details of your problem direct for recommendations.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

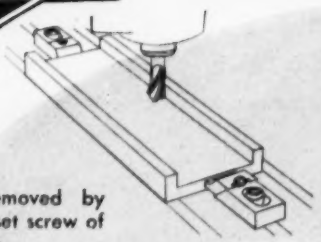
14408 WOODROW WILSON • DETROIT 3, MICHIGAN

J & S TOOL CO. INC.

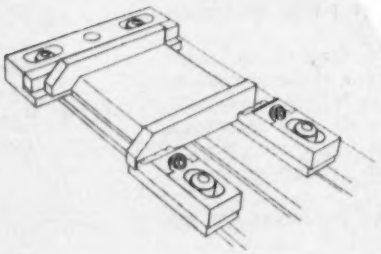
Eliminate U-Clamps, Straps and Fingers

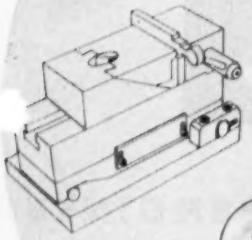
J & S *All-Purpose* JAW CLAMPS

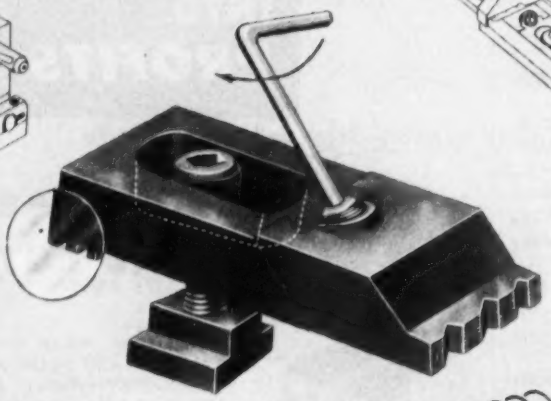
secure work-pieces quickly and rigidly
easily adapted to box fixtures



Work-piece removed by loosening one set screw of one clamp only.

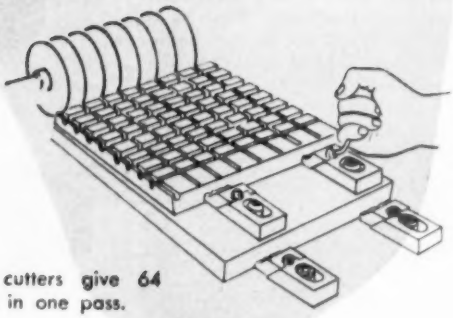






J & S Double Half Vise, for use on jig borers, millers, planers and shapers.

Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.



Eight cutters give 64 pieces in one pass.

NEW METHOD OF SECURING WORK-PIECES TO MACHINE TOOLS

for Lathes, Planers, Milling Machines, Boring Millers, Jig Borers, etc. (9 different types incuding new Counter Clamp)

1. **Faster Set-up:** *One adjusting screw* provides a 5-ton force to *position* and *hold* the work-piece.
2. **Stronger Grip:** The *inward* and *downward* movement of the jaw clamp at a 45° angle gives a *single, powerful clamping action* — easily applied and controlled.
3. **Less Obstruction:** You can pass over the whole clamp 1" from the working surface of the machine face. *No interference with reading or measuring tools.*

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WRITE FOR NEW FOLDER!
— contains complete details on advantages, applications, types and sizes available.
Booklet describing J & S "Fluidmotion" Wheel Dressers, etc., also sent on request.

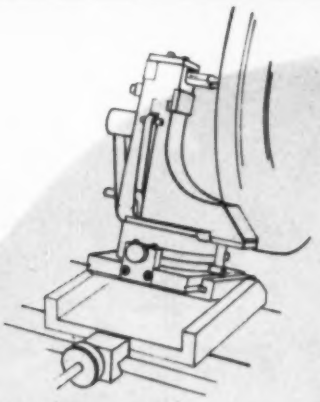
HIGH-CARBON, HIGH-CHROME CONSTRUCTION

.0001" ACCURACY

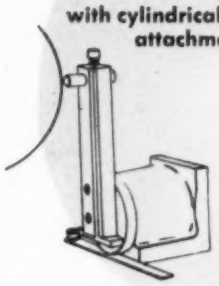
Fluidmotion

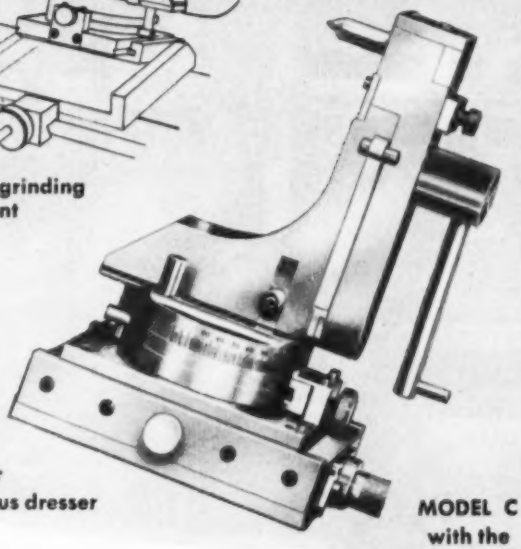
WHEEL DRESSERS

dress two angles tangent to a radius in one continuous motion

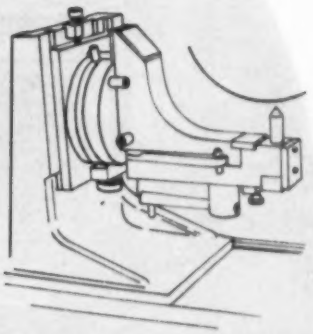


with cylindrical grinding attachment



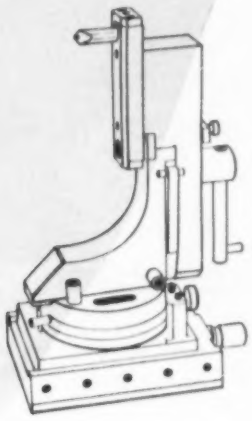


Form-master low cost angle or radius dresser



with under wheel attachment

MODEL C with the micrometer feed



Model HC-36 for wheels up to 36" diameter

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the "Fluidmotion" Dresser, you can *dress* two angles *tangent* to a radius—using one handle *in one continuous motion.* Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

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New home of J & S Tool Co., Inc.

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A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.

The TOUGH Jobs are "Routine" on a KING

62" KING Vertical Boring & Turning Machine at Beloit Iron Works, Beloit, Wisc.

KING 50th ANNIVERSARY 1902-1952 VERTICAL BORING & TURNING MACHINES

"Tough" is the word for the job being machined here. But it's "all in the day's work" for this versatile 62" standard KING.®

Just check over the things required in a boring mill to efficiently, economically machine this job. You need:

1. A ***speed range*** wide enough to turn the small diameter center post and still do turning and form tool work on the large outside diameter—both at efficient cutting speeds.
2. The ***right feed*** to provide acceptable surface finishes.
3. ***Hand controls*** sensitive enough to permit easy feeding of a large radius form tool.
4. ***Extra weight and rigidity*** that are necessary to provide chatter-free finishes.
5. ***Accuracy*** that will check out with a contour gauge.

Because KING mills have *all* of these advantages they meet *all* the requirements of this intricate job—just as they meet the boring, facing, and turning requirements of any other work, simple or complicated.

That's why, today as for half a century past, KING is industry's first choice for fast, accurate, profitable production. For full details see the King distributor in your locality, or write us direct.

King Vertical Boring & Turning Machines are made in 10 sizes —30", 36", 42", 52", 62", 72", 84", 100", 120", and 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **The critical list of machine tools (Exhibit D of NPA's amendment to M-41) will be abolished soon,** enabling builders of these machines to fill orders from unrated customers in the 30% of total output reserved for other than the armed services. This change is likely to take effect with July or August shipments. For other machine tool developments, please turn to page 123.

- **Fringe benefits, even at expense of wage increases, will be big union objective this year.** Richard P Doherty, former industry member of Wage Stabilization Board, says. More unions will try to get into welfare and pension business, as they have in coal mining and electrical construction industries. Welfare, health and pension plans are expensive, Mr. Doherty states, and should be adapted to economy of individual companies rather than to standard patterns.

New hard tool material, a double boride of molybdenum and nickel, has been tested for 90 min, cutting steel of over 200 Bhn hardness at 220 sfpm, with feed of 0.010 ipr and depth of 0.10 in. Tool life is comparable to carbide in most applications, but brazing tip to toolbit shank is easier. Density of material is 2/3 that of carbide. All raw materials are obtainable in US.

- **Elimination of materials allocations may save up to 10%** in total manufacturing costs in many plants. Steel users, for example, have been receiving much material of off-standard specifications or incorporating a variety of defects, the result of pressure on mills to ship anything and everything. Extra handling of such material has involved heavy costs.

- **General adoption of machinability data, based on microstructure, appears to be far off** in mass-production industries. Large-volume production of metals does not lend itself to supplying materials with sufficiently uniform structure to permit such adoption.

- **Urgent need for larger metals production in Texas Gulf Coast region** is revealed in survey released by Houston Chamber of Commerce. Some 73 companies said that more steel production is essential if manufacturing costs in Texas are to be cut. Shortage of aluminum rolling mills also was named by 14 companies as a handicap.

- **The making of boron steel castings is an experiment being tried by several steel foundry companies.** Use of boron as an alloying element is causing much talk in the industry.

- **Device that raises car windows and convertible tops when it rains** will be offered directly to the public next month by Micro-Moisture Controls, Inc, New York. "Weather Guard" consists of a grid that can be installed on any exposed part of a car. When a few raindrops hit it, contact is made with relays operating off the car battery and windows and convertible tops raise automatically. Unit operates only when ignition is off.

Upswing in marine machinery production will continue through '53, predicts H G Bauer, De Laval Steam Turbine Co, who bases his forecast on current military and civilian orders for propulsion units, turbo-generators, centrifugal and rotary pumps for marine installations, and a heavy backlog of orders for marine machinery.

- **France is afraid of delays in settling US offshore purchase orders.** French Under Secretary for Air Pierre Montel claims the country's production lines are tooled up but US blocking of financial aid to carry out defense manufacturing is seriously affecting aircraft production.

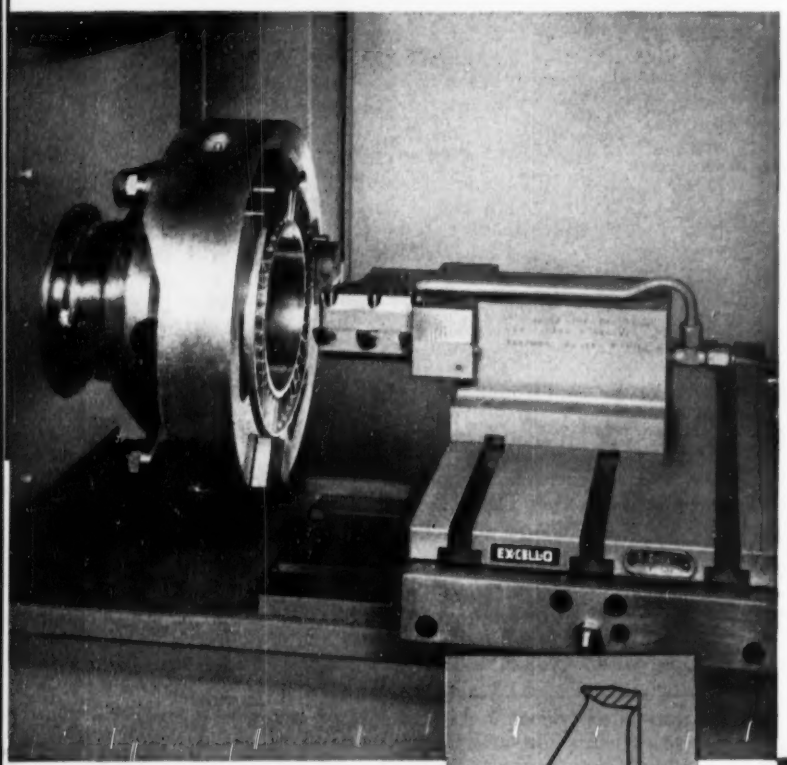
- **Austin is putting out a smaller, cheaper model this year.** The A-30 "Seven" carries four passengers in place of five carried by its other small models, gets 40 miles per gallon, will do over 60 mph, and retails in the US at $1495 including taxes, $300 less than any other Austin.

- **Italy will ship $10 million in heavy machinery to Mexico on consignment** this year in an effort to crack the lucrative South-of-the-Border market, states the Italian Chamber of Commerce in Mexico.

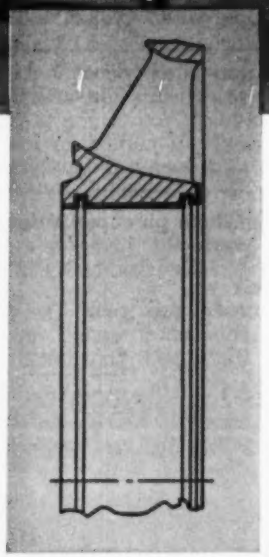
Maximum Flexibility

WITH MINIMUM TOOLING

Ex-Cell-O Style 2112-A
Precision Boring Machine



View of tooling set-up for rough- and finish-boring, counterboring, grooving and facing of tank parts.



Sectional view showing operations in heavy lines.

XLO
EX-CELL-O for PRECISION

Standard Ex-Cell-O Machine Bores, Grooves, and Faces

It's advantageous to use standard machines and standard items of tooling whenever possible. You cut engineering time, save money, and get your machine sooner.

The set-up illustrated handles several operations on two similar aluminum tank transmission parts with a minimum of special tooling. Machine, hydraulically operated cross slide, spindle, spindle bridge, motor bridge, and control equipment are all standard items. Only the chuck and tool block are special.

Here is a typical example of the flexibility and economy that are yours with Ex-Cell-O Precision Boring Machines. See your local Ex-Cell-O representative or contact Ex-Cell-O in Detroit.

EX-CELL-O
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MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • PARTS ASSEMBLY

52-12

Washington

President Eisenhower's message pulled the plug on all wage and price controls. The whole program had been on the skids under Truman. Eisenhower's promise to "taper off" put a quick halt to the whole works—processing of papers, investigation of violations. Agency workers were put on notice they would be let out in 60 days.

Price increases on metals and metal items are certain. Top OPS officials have predicted price hikes ranging up to 10%. Take their guess as to size of increases with a big grain of salt, but their list does put the finger on items pushing price ceilings. OPS predicts an increase of 3% is due on carbon steel and more on semi-finished steel products; 9% on stainless and other alloy steels; copper up by "5 to 9 cents per lb"; aluminum up 1 cent and perhaps 5% on products.

Industry sources say OPS is wrong—that any slight increases will tend to level off quickly once we readjust to true supply-demand relationships.

There will be no stand-by law on wages and prices after April 30—despite proposals for this by Sen Capehart, whose committee writes the controls legislation. Taft and the vast majority of Republicans — and Democrats — want no stand-by authority on the books.

• • •

The paper-shuffling on materials controls is about finished, too. All Eisenhower asked was authority to guarantee delivery of materials when needed to contractors making military and defense-supporting items. In other words, if it's a case of a military supplier or a civilian producer getting an item in short supply, the civilian waits in line.

This means that CMP is finished. Second quarter allotments are already out. Tightest controls are on use of copper and aluminum in such civilian products as venetian blinds, decorative hardware, and a long list of similar less essential products. They're still held to 50% of pre-Korean use of copper, 55% on aluminum. As things stand now, they'll be able to buy all they can pay for after June 30.

• • •

Lifting of wage and salary controls comes at a time of relatively little pressure for wage increases. Cost of living is at its lowest point in six months and most big contracts in metalworking are locked up until summer.

General Electric and Westinghouse agreements are subject to reopening on wages next month. But there will be little if any justification for a wage increase at this time. Nothing has happened since last fall's wage boost to justify still higher wages.

Basic steel contracts may be reopened on wages, but not until July 1. In aircraft, recent increases have just gone through the Wage Stabilization Committee. Most aircraft wages are bargained in the fall, although negotiations at Convair and Boeing come up this summer.

Continuation of the "old" cost-of-living index—along with the new index—until June delays until then a showdown between UAW-CIO President Walter P. Reuther and the automobile industry. Unless Reuther can convince the industry that the old index, as reconstructed by BLS, is not identical with the one the industry has been using for escalator contracts.

This will bring negotiations in basic steel and automobiles to a head in June—just when Congress will be making up its mind on how to revise the Taft-Hartley labor law.

Sen Taft's proposed amendments covered only technical aspects of Taft-Hartley, did not touch on national emergency strikes or industry-wide bargaining. A serious strike-threat in June may impel Congress to strengthen the national emergency strikes procedure.

• • •

Defense Department's $500 million appropriation request for reserve tools and facilities is almost sure to be okayed by Congress. This would be an initial step in carrying out the Vance Committee's basic recommendation: that the military start buying critical long lead-time equipment now, to build up stand-by production for military end-items.

Up to $100 million of the money will be used to buy or lease existing plants now privately owned. These would be general-purpose plants, built with the aid of fast tax writeoffs to produce military goods, which the owners now want to use for normal manufacturer.

Cutbacks in military procurement schedules have allegedly made operation of many of these plants unprofitable. Many companies are asking the Pentagon to step up procurement or for permission to convert to regular production. The Pentagon is reluctant to see these facilities used for non-military output, and would use the special fund to buy the plants or lease them on a standby rental basis.

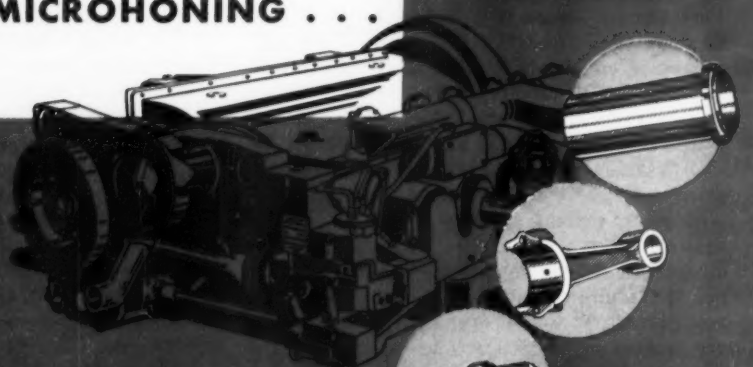
• • •

Change in Formosa policy means more arms, shipments to Chiang. The weapons will be new ones instead of obsolete World War II P-47's and worn out landing craft. Reason is that if the Nationalists are to raid the China coast and coast-wise shipping, they need the latest weapons to get back home again. Chiang will probably get destroyers, destroyer escorts, jet fighter-bombers, and recoilless rifles.

INCREASED EFFICIENCY OF

DIESEL ENGINES

THROUGH MICROHONING . . .



CUMMINS AUTOMOTIVE MODEL NHHB-600 ENGINE

PRECISION PRODUCTION THROUGH MICROFINISH

MICRO MATIC

Diesel engines are chosen because of their dependable low cost power. The more precise the fit of parts, the more efficient the engine.

MICROHONING gives to functional surfaces of

- cylinder liners
- connecting rods
- valve guides
- injector barrels
- pump discs . . .

accurate size, true geometry, and the characterized finish—all at production rates.

For information on MICROHONING of DIESEL ENGINE PARTS

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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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Hallidie Machinery Co., 2726 First Ave., South, Seattle, Wash. • *REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES*

Detroit

From one of the leading factors in the automobile business: "Five years from now power steering will probably be as close to standard installation as automatic transmissions are today. This will be true on the lowest priced cars as well as the highest priced ones."

Gemmer Gear at Detroit, Saginaw Steering Gear Div. at Saginaw, and Borg-Warner appear to be the big factors in this field right now.

Others want in. Most active in this respect may be Monroe Auto Equipment Co., whose booster-type hydraulic mechanism (Gemmer's and Saginaw's are also hydraulics; Borg's is mechanical) is being tested in a number of automobile companies today. Ross Gear and Tool at Lafayette, Ind., is also supposed to have an entry.

The largest expansion for production of power steering devices is currently 500,000 sq ft addition at Saginaw Steering Gear Div. This will be finished by late autumn, will require 1500 workers. Current 50,000-a-month production is 10 times that of late '51.

Part of Saginaw's expansion will be on a second type of power steering, a linkage booster system located underneath the car.

Meanwhile, automatic transmissions continue to increase their share of the market. Ward's Reports found automatic transmissions on 47.4% of 1952 auto production, overdrives on 14.4%.

• • •

Plastic bodies for automobiles are more and more in the news. Kaiser-Frazer will go into production on a run of some 2,000 sports cars with spunglass bodies starting this summer.

Chevrolet is understood to be rushing into production as rapidly as possible with its Corvette, the single seater sports car unveiled with such success at the recent New York show.

Plastic is still a long way from being a volume-run material for bodies, but for low-production runs, tooling will cost perhaps 10% of that for steel bodies.

• • •

Ford has cancelled plans for a $15 million automatic transmission plant near Cincinnati because of local opposition. The company already has one such plant on that city's outskirts. But this expansion move is far from dead. The plant likely will be located elsewhere.

• • •

A little more competition for automobile business may be developing among the vendors. With some prices down, others up, net effect appears to be a 2% saving over six months ago.

Purchasing agents don't expect any significant changes for several months. Meanwhile, parts suppliers are thought to be maintaining profit margins.

Reo Motors, which has already branched out into the wheel goods business (toys) recently went into production of a build-it-yourself inboard marine engine kit.

• • •

Chrysler is building a $3.1-million factory for the government for tank modification, right next to the Chrysler Delaware Tank Plant at Newark, Del. The new facility will come into use late this year, will modify and process tanks.

• • •

Ford Div. will build a one-story, 31,000 ft technical service laboratory before next summer to test methods, tools and parts for servicing cars.

• • •

Like guessing games? Ask yourself this question: How many different combinations can I select from if I walk into a Ford dealer to order a C4? You have 12 body styles to choose from, 12 single-tone colors, 14 two-tone color combinations, two engines, three transmissions, six axle ratios, nine interior trims, four tire sizes and many accessories and optional items. In round numbers: 205,000 combinations.

If that sounds incredible, consider these figures: There are 250 variations on standard Plymouth engines alone, and more than 3500 combinations available on Plymouth bodies, excluding variations on the complex instrument panel.

• • •

Detroit Ordnance District has broken a hitherto classified story involving an urgent request from General Eisenhower a month after D-Day in 1944. The General reported Allied forces were seriously jeopardized by the new thick-skinned German Tiger tanks. Allied soldiers needed an anti-tank shell that would penetrate their heavy armor plating.

Army Ordnance had nothing available but had been working with G-E's Carboloy Dept on development of a shell that would meet the test. Ordnance asked for immediate production of some carbide shell cores. Two days later, a job that would ordinarily have taken months was finished: 10 cores were flown to Aberdeen Proving Grounds for testing. Three days after that, Aberdeen okayed the cores. Less than two weeks later Carboloy was in full production.

Here's how Carboloy did it: a grinder was flown in from Connecticut; two other machines were unloaded from an outbound ship at San Francisco and shipped to Detroit; a special sintering furnace was built in a record 19 hours; a steel storage shed was cleared for manufacturing space; necessary hydrogen supply was located in Ohio and trucks needed to transport it were brought up from a Navy base in Texas. Finished shells were flown direct to France.

"Inside Story" on doubling production at the Minster Machine Co., Minster Ohio

This GRAY 6" PLANER TYPE BORING MILLING AND DRILLING MACHINE is really delivering "versatility with a punch."

Here's why:

- rotary table **84" x 96" permits quick, accurate positioning of multi-ton load.**
- pendant control **always within reach to provide instant control.**
- automatic power clamps **reduce manipulating time —insure uniform alignment conditions.**
- gray non-metallic ways **protect all precision guide surfaces.**
- 40 H. P. **efficiently transmitted to the cutter makes it a high power carbide miller.**

Production times have already been cut in half. Further savings are assured when they "open her up."

The G.A. **GRAY** Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Machine Tools

Machine tool controls are to be minimized as rapidly as possible. First move in that direction is an order just issued by the National Production Authority eliminating the filing of order boards by machine tool builders, except for critical machines, after January, 1953.

The forms covering critical machines (Exhibit D) will be filed hereafter on a quarterly basis rather than monthly. This means that March 31 is the next time that builders with critical machines must file.

NPA cautiously comments in its order that this relaxation in requirements does not signify that the reporting of order boards is being discontinued permanently.

• • •

NPA explains that the action has been taken for two reasons: (1) The improved delivery position of machine tools; and (2) the cutback in the working force of NPA. The Metalworking Equipment Division today has about 80 employees, or one-half the number at the peak.

Builders will receive two-weeks' notice if NPA should need order boards at some future date.

• • •

The so-called critical list of machine tools, reserved exclusively for rated customers, is about to be abolished.

The plan at one time was to retain the list but free it from some of the types of machines now on it.

An order is about to be issued doing away with Exhibit D (the critical list) entirely. It may have been made public before you read this page.

• • •

As soon as this order comes through, machines formerly on the critical list will be subject to allocation of 70% to the armed services and 30% to other rated and unrated customers.

Beginning with deliveries probably in July, builders will be able to supply to unrated customers machines which up to now have been held exclusively for rated orders.

If the armed services do not take 70% of the deliveries of these machines, builders can ship more than 30% elsewhere.

• • •

It is expected that eventually deliveries of these machines will improve to such an extent that the 60%-40% ratio prevalent as a whole on machine tools will apply.

Only a small group of machine tool builders at best is affected by the new order.

Pentagon has come up at long last with a realistic list of its projected machine tool requirements over the three years 1953-1955.

It adds up to roughly $550 million. The list is understood to consist of two parts: (1) Machines for which funds have already been appropriated; and (2) machines for which money must yet be acquired. The latter is said to be much bigger than the former.

It is possible that defense purchases may be more than this list indicates. But it is well for builders to look facts in the face and realize that the industry is far past the peak of defense requirements, unless a new Korea occurs.

• • •

No pool orders will be issued for long-lead-time machines—the so-called "elephants." Orders will come directly from defense contractors.

The pool order program, in fact, is about at an end. Washington believes that it has served the purpose for which it was set up. There is no point in stretching it out farther.

Several recent applications for pool orders have been denied, in line with this policy.

• • •

An erroneous rumor has been going round that Mutual Security Administration has bought for delivery to western Europe a number of foreign machine tools now in this country.

MSA does not buy any machine tools direct, to begin with. What's more, it does not have authority to spend its money, through recipients abroad, for foreign machine tools.

Here is what MSA will do: It will supply financial assistance to a western European shell manufacturer to buy U.S. shell lathes to fill a contract which is part of the US off-shore military procurement program.

• • •

Contracts for this program are being let from the Heidelberg, Germany, headquarters of US Army Ordnance Corps.

Main stipulation is: That European manufacturers must submit bids within the formula of US costs plus 10%. This appears to be a tough requirement because there is considerable spread between one US company's cost and another's, and because the initial cost of making shell in Europe probably will be high.

Some $400-$500 million of ammunition contracts are likely to be let in Europe before June 30.

BF

SHOP TIPS

New, Free Magnet Idea Kit for Shops

A handy new literature kit showing the hows and whys of permanent magnets is currently sparking shop men to real savings in time, money, effort.

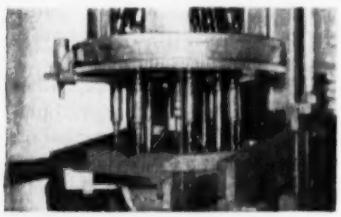
To date, the magnets have proved very effective as sheet steel separators, magnetic stands, tool-holding devices, sweepers' "pickup" tools, paper grippers and tool retrievers, to name a few uses.

Magnet Idea Kit can be obtained free from Carboloy Department of General Electric Co. (See address at right.)

★ ★ ★

Drill Cast Iron with Carbide Twist Drills

Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over



H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Co. (See address at right.)

★ ★ ★

New Masonry Drills Won't Stall, Pack

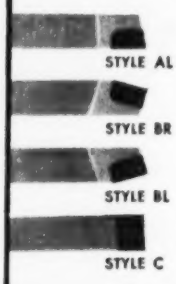
An outstanding advance in rotary drilling of masonry was recently unveiled in Carboloy oval-flute "Live-Spiral" Drills.

The drills, tipped with Carboloy cemented carbide, won't stall or pack even at very rapid speeds. They work equally well in concrete, brick, plaster, slate or asphalt. For full details write Carboloy Department of General Electric Company. (See address at right.)

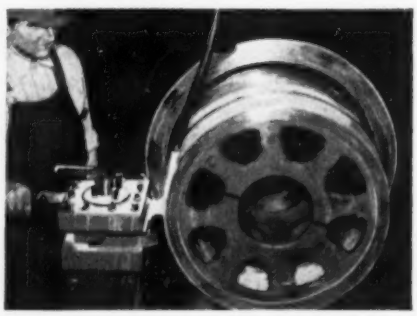
YOUR CARBOLOY FIELD ENGINEER SAYS—

We can help you get swift tool-

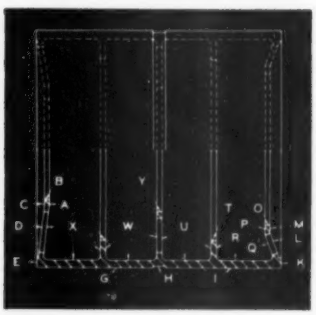
Here's how one leading manufacturer quickly adapts low-cost Standard Carboloy Tools to his single-point tool machining operations – jobs that would normally require costly "specials" – and gets them on the jobs *in minutes*. No special grinding equipment. No delays or heavy inventories. By standardizing on "Standards," he gets full carbide benefits shop-wide – just as you can. Check these pages. Then send me blueprints of your tough single-point tool jobs. We'll show you how easily "Standards" can be best for you, too.



1 Gets 14 "specials" from these 4 styles of "Standards" – A large Midwestern manufacturer (name on request) needed 14 specially shaped tools for a rush job on cast steel gear blanks. From their stocks they selected the 4 Standard Carboloy Tool styles shown . . . ground them to the shapes needed in minutes per tool. No long waits for costly "specials," no extra expense or production delays. (See illustrations, below and on right-hand page.)

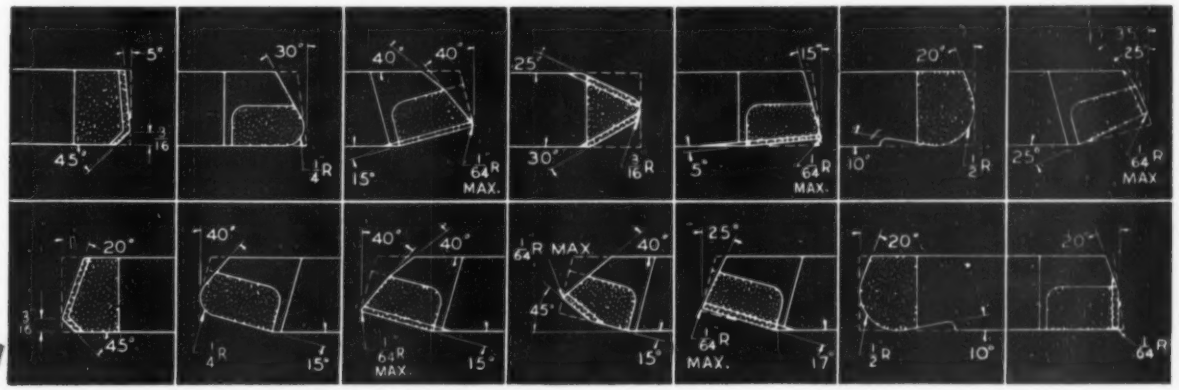


Here is the job – a tough steel casting 26" in dia., 28" wide, and requiring a wide variety of rough and finish turning, facing and boring operations.



Sketch of side view of part showing many of the single-point tool machining operations necessary for the job.

convert to Standard Carboloy Tools and ups, low inventories, lowest tool cost



Dotted lines show the original tip ends of the 4 styles of Standard Tools before they were ground to these 14 special shapes in minutes.

2 **Easy for you to use, also**—Adapting Standard Carboloy Tools to your special-tool needs is a cinch. They can be rough-ground quickly on ordinary silicon carbide wheels, finished economically on diamond wheels. Standard Carboloy Tools stay sharp up to 10 times as long as high-speed steel tools, last 10 times longer, too.

3 **You get quicker tool-ups** – You'll cut tooling delays to minutes instead of days or weeks with "Standards" on your shelves. Your inventories will be lower – costs, too. Just 11 styles of Standard Carboloy Tools can be adapted to do up to 80% of all your single-point tool machining.

4 **You enjoy plant-wide benefits** – Let us help you convert to standard styles of Carboloy Tools – for plant-wide benefits. Thousands of shops have done so . . . and now profit from such things as production gains of up to 300%, downtime savings that alone more than pay for the entire cost of the tools.

To get maximum performance from Standard Carboloy Tools, we have the industry's best all-around Carbide Service Program. Includes all types of free how-to-do-it technical data, a tuition-free training school, etc. For details, mail coupon today.

CARBOLOY TOOLS ARE STOCKED COAST TO COAST BY

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Look under "Tools" in the Yellow Pages of your local telephone book, or in Thomas' Register, for address and phone number of your nearby Carboloy distributor, branch or district office.

"Carboloy" and "Live-Spiral" are registered trademarks of Carboloy Department of General Electric Company

5 **Send blueprints of your "specials"** – Let us review your single-point tool machining jobs that now require costly special tools . . . show you exactly what "Standards" can be adapted, and how. Send blueprints today to the factory at Detroit, or to your nearest Carboloy District Office. No charge or obligation. See coupon below.

MAIL COUPON TODAY!

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11149 E. 8 Mile Ave., Detroit 32, Michigan

Gentlemen: Please send me, at no cost or obligation, Carboloy General Tool Catalog, GT-250.

☐ Also, I am enclosing ( ) blueprints or sketches of the single-point tools we use. Show me, free of charge, which low-cost Standard Carboloy Tools can be quickly ground to these special shapes (and how to do it).

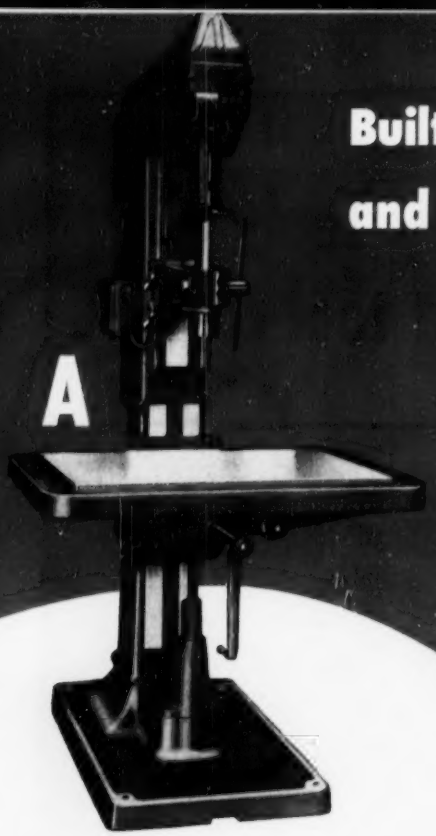
Name _____ Position _____

Company Name _____

Address _____

City _____ Zone ____ State _____

Built for ACCURACY . . . SPEED . . . and Long Lasting PERFORMANCE . . .

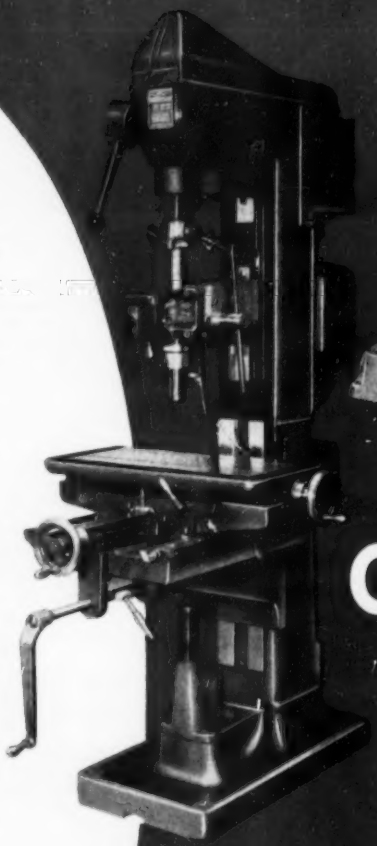


Avey

BMA-6

TOOL ROOM DRILLS

Built in No. 2 and No. 3 Sizes



A. LARGE TABLE MACHINE—The large heavily ribbed table, 34" x 25" plus ample chip trough, allows room for large dies or fixtures, plus additional space for tooling, etc. Each six splined precision ground spindle and drive sleeve is supported by five rows of precision ball bearings which give the precision needed. The machine has six speeds which are easily obtained through a shifter lever, positioned in front of the machine. The machine also has three speed ranges, low, medium or high which are easily changeable for future jobs requiring higher or lower speeds.

All BMA-6 Machines may be obtained in hand feed, Avey-matic automatic feed, and power feed with or without reversing motor and control for tapping.

No. 2 BMA-6 Machines may be obtained with #2 or #3 Morse Taper, optional and #3 BMA-6 Machines may be obtained with #3 or #4 Morse Taper optional.

B. ROUND TABLE TOOL ROOM MACHINE—The drilling unit is mounted on a round table, lower column, and base. The base is planed and regularly furnished with two tee slots. Above the planed base is one auxiliary bracket adjustable vertically which may position a vee center, a cup center or an additional table. Beneath the spindle is positioned the regular round table, which is 18" in diameter and contains tee slots and coolant trough. This table may be tilted either way up to 90° or can be moved to the side or rear of the machine to allow work to be done on the lower table or planed base.

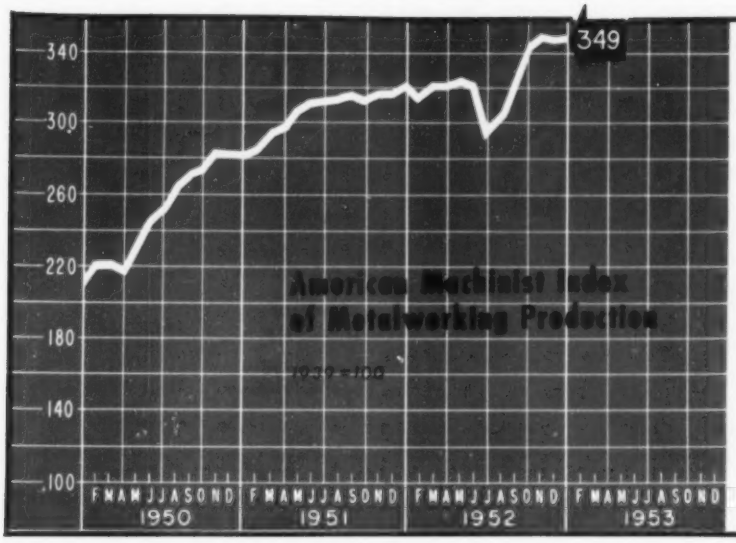
C. COMPOUND TABLE MACHINE—This machine is ideal for tool rooms and die shops and may be used for layout purposes which greatly assists jig bore work. The compound table is rigidly supported by a ball bearing mounted elevating screw and has vertical adjustment on the dovetail of the lower column. The working surface of the table is 25" x 12" plus ample chip and coolant trough. In and out travel of the table is 5" either way and cross travel is 7½" either way. Both tables are moved by Alloy Steel lead screws with automatic wear take up on screws.

Both tables are scaled in ½" with dial reading on lead screws graduated to read .001. (one turn equals .250). Both tables have felt wipers on ways and table surface is regularly furnished with two longitudinal tee slots.

Avey

THE AVEY DRILLING MACHINE CO. Cincinnati 1, Ohio

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JAN '53(*)	DEC '52(p)	NOV '52(r)	DEC '51
	358	**362**	**353**	**318**
Machinery	**331**	**320**	**320**	
Electrical Machinery	**417**	**405**	**362**	
Autos	**273**	**270**	**219**	
Other Transportation	**588**	**573**	**487**	
Other Metalworking	**358**	**354**	**316**	

(*) Estimated (p) preliminary (r) revised

Metalworking production promises to clip along at the current dizzy pace during the first quarter.

It probably will stay where it is through the entire first half. If not, the dip will be only slight.

Armament output is a big factor in this situation. But many civilian-goods industries are contributing heavily to the breath-taking rate of present operations.

Nevertheless manufacture of defense goods is giving that extra push to metalworking operations which is keeping activities at a peak.

• • •

Many civilian-goods industries too are contributing heavily to the current breath-taking rate.

Automobile makers are a prime example. They are confidently expecting better than a 6-million-unit year in '53. Their first-quarter assemblies are geared to that high-level schedule.

Appliance manufacturers are in the same class. They are in the midst of one of their biggest quarters.

Don't overlook the machinery people—not just machine tools but industrial machinery in general. They are doing all right, too.

• • •

Many component parts makers are clocking up new records or are coming close to it. Bearings manufacturers, for example.

One large company producing bearings set an all-time mark the past month.

The chief materials—steel, copper, aluminum—are beginning to fade as a worry. Despite the terrific total of manhours worked in Metalworking, manpower is not a critical problem except in a limited number of areas.

Gray iron casting business has picked up considerably. Improvement is in light and medium-size castings. Market for heavy castings has been consistently good the past 10 months.

Note one trend, however. Castings users are buying for one month instead of 2-3 months. The same trend is true in other materials.

• • •

Farm implement people are counting on a very good year. But it probably won't quite come up to 1952.

First quarter sales will be down some from last year. One should remember, though, that the volume in '52 was inflated by a certain amount of scare buying by farmers and dealers who feared shortages springing from lack of materials.

After the scare ended the middle of last year, dealers sold more to farmers than dealers ordered from manufacturers. That had the effect of slowing down farm implement output the last half of the year.

Second quarter implement sales are expected to be big. Manpower and materials are not likely to be troublesome throughout 1953.

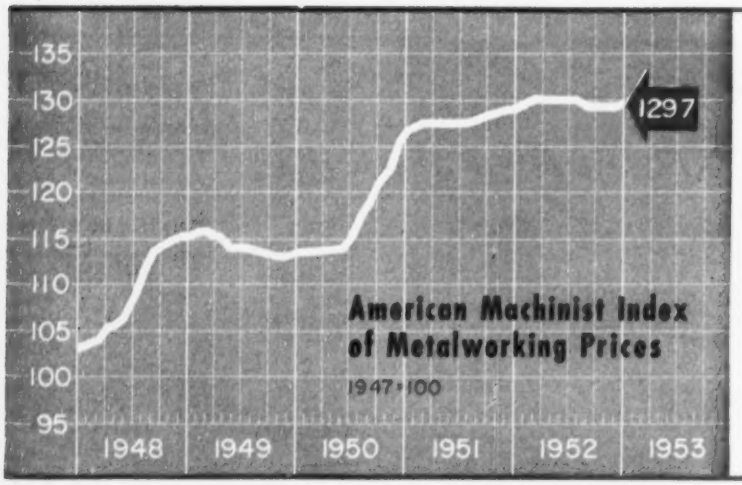
• • •

Freight car building industry is running at about 60%. It isn't likely to get much better until the fourth quarter, if then.

Recent publicity about railroads planning to buy enough cars to build up car production to 10,000 a month by the fourth quarter has not yet been translated into firm orders.

Railroads are believed to be waiting for ICC decision on rate raises before placing orders.

Gaging Business



PRICE INDEX

	JAN '53(*)	DEC '52(p)	NOV '52(r)	DEC '51
	129.7	**129.6**	**129.5**	**129.1**
Metalworking Machinery	137.7	137.7	137.2	
Other Machinery exc. Electrical	132.3	132.2	132.5	
Electrical Machinery	124.4	124.4	126.8	
Fabricated Metal Products	128.1	128.0	126.6	

(*) Estimated (p) preliminary (r) revised

Industrial output continues up. January index of Federal Reserve Board is estimated at 237 (1935 to 1939 equals 100)—2 pts over year's end, well over Jan '52.

Index is only 10 points below World War II peak.

Durable goods production is at boom level. January was 12% higher than in same month of 1952.

• • •

Civilian employment was 61.5 million in December. That was down a bit from November as result of drop in farm work. There were more non-farm workers in December than in November.

Employment in manufacturing industries was at the highest point in December since the war—16.7 million workers.

Gains were reported in aircraft, ordnance and electronics equipment plants.

Consumer goods industries showed almost no change in numbers of workers in December compared with November. January went up a little.

Wholesale prices of farm products declined farther in January. But industrial commodities continue to be steady. If anything, they moved slightly up here and there.

Impending removal of ceilings means that industrial commodity prices are likely to go up rather than down. Observers expect that prices of individual items below the ceiling will go up.

Question is: What will be the attitude of management toward inventories? Raw materials stocks of many metalworking companies are the lowest in several years.

• • •

Reinstatement of old cost-of-living index of Bureau of Labor Statistics may help to keep wages from going to higher levels in certain industries, notably automobiles.

Consumer buying has pushed consumer credit up another $1.2 billion. Credit outstanding at year-end was $24 billion, a new peak. More than $3.3 billion was added to consumer debt in '52.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	256.4	254.9	236.1
Steel ingot operations (thousands of tons)	2,154	2,240	2,090
Electric power output (million Kilowatt hours)	8,151	8,144	7,616
Production of automobiles and trucks	150,381	149,578	102,402
Engineering construction awards (*Eng. News-Record*—millions)	$288.5	$599.9	$167.1

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$355.5	$343.4	$337.1
Expenditures of new plant and equipment (millions)	$ 28.7	$ 28.3	$ 27.4
Profits after taxes in primary iron and steel industry (millions)	$ 127	$ 110	$ 176
Profits after taxes machinery industry (millions)	$ 239	$ 290	$ 227
Profits after taxes electrical machinery industry (millions)	$ 140	$ 131	$ 97
Profits after taxes in motor vehicles and parts industry (millions)	$ 198	$ 262	$ 177
Motors and generators new orders index (1936 = 100)	463	517	600

* Seasonally adjusted

THE ROAD TO GOOD BROACH TOOLING

Paved by Defense Production . . . Profitable for Civilian

The demands of defense production during the second world war, as well as those imposed in the present emergency, have fostered great advancements in broach tooling. Now accomplished, these advancements are literally the signposts of broach tooling design for current defense production. Applied to civilian production they open the door to a whole new world of cost-cutting possibilities . . . parts can be processed with fewer operations, broach tooling lasts longer, minute dimensional limits can be held with ease and economical broaching production can be had without long-run production quantities.

As substantial contributors to these advancements, Detroit Broach engineers can be relied upon to incorporate the latest and finest of procedures into the design of your tooling. It will pay you to keep this in mind when considering broach tooling for *your* production.

Proper chip removal
Prolonged tool life
Precise form cutting
High surface finishes
High production rates
Easier loading of parts
Universality of fixtures
Automatic machine cycling
Better operator visibility
Extremely close tolerances
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Economy in high AND low production

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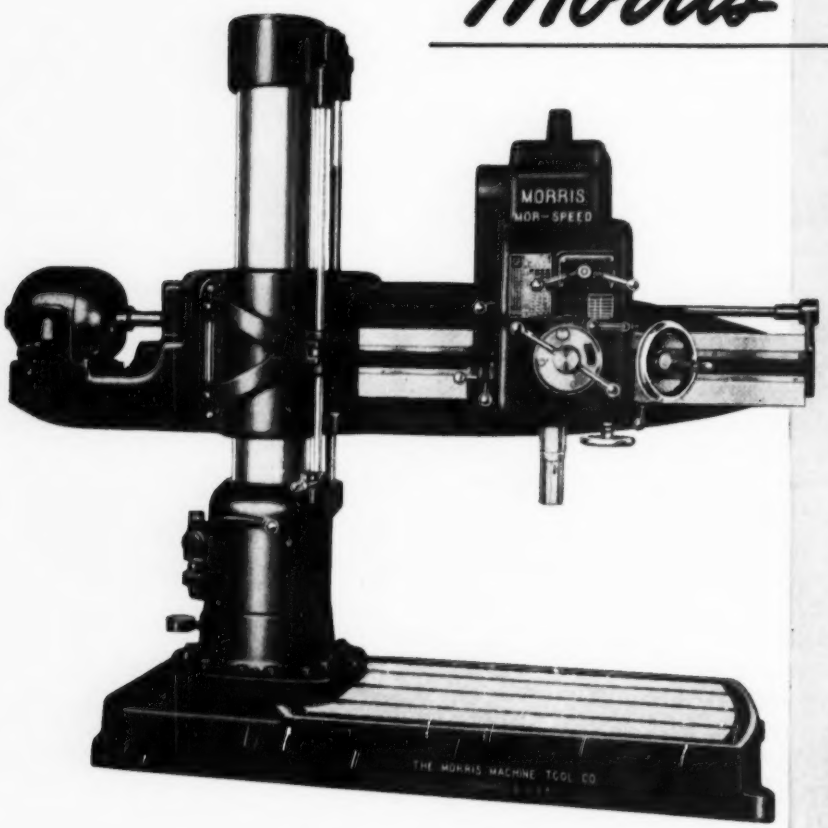
Morris

MOR-SPEED RADIAL DRILLS



Designed to set a cost-killing pace in the race for profitable production, MORRIS Mor-Speed RADIAL DRILLS offer a long list of outstanding features:

- ★ Centralized Controls—Reduce time between cuts.
- ★ Variety of Speeds and Feeds—Better selection of the right combination for every job.
- ★ Automatic Lubrication — Saves wear, insures accuracy.
- ★ Greater Strength, Rigidity and Balance — Provide greater machining precision.
- ★ More Automatic Stops—Save time and reduce manual control.

If you're interested in removing metal faster, write for your copy of the new MORRIS Mor-Speed RADIAL DRILL catalog.

a better product at less cost with precision PLUS production

Morris Mor-Speed Line

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

A Fresh Start on Depreciation

Depreciation rates and the metalworking industry's expenditures for new plant and equipment have a close affinity. Both in World War II and after Korea the federal government was eager for industry to expand and modernize its facilities. At both times, it permitted speedy write-offs of new capital investments.

Capital spending soared as a result. At last report, some 5317 certificates of necessity involving $1,556,198,000 had been issued to metalworking companies alone. This huge volume illustrates the potency of Washington's offer to depreciate new plant and equipment within five years, rather than stretching out the time to ten to twenty years.

MANY FORECASTS NOW are being made of a decline in capital spending later this year and in 1954. And it is an acknowledged fact that capital spending and industrial prosperity go hand in hand. What better way to keep such investments at or near the present peak than to enact into law on a permanent basis the principle of quick write-off of capital investments which has worked so successfully in two emergencies?

CONGRESS FORTUNATELY is to have the chance soon to pass such a law. Senator Frear of Delaware has introduced into the Senate a bill (S.298) which will allow a taxpayer to write his own timetable for taking depreciation allowances.

This bill is now in the hands of the Senate finance committee, where it probably will stay until the House disposes of a similar bill, yet to be introduced. It is customary for tax legislation to originate in the House, hence this delay in the Senate.

The Frear Bill would let companies write off production equipment in as little as one year. But once a specified time has been chosen, the decision is binding and the management must stick with it.

This principle — that manufacturers may select whatever period of time they desire in which to depreciate their equipment — should have been the law of the land long ago.

QUICK DEPRECIATION has worked well in many countries. It was chosen by Hitler to get German industry to expand and modernize in the 1930's. It has been used with beneficial effects in Sweden, England, and Canada to stimulate replacement of old production equipment with new and to induce industry to spend its own for enlarged facilities.

There is no reason why it won't work successfully here. To be sure, every metalworking company won't take advantage of quick write-offs. But enough of them have indicated that they will, on the basis of private inquiry, that capital outlay will be given a substantial lift.

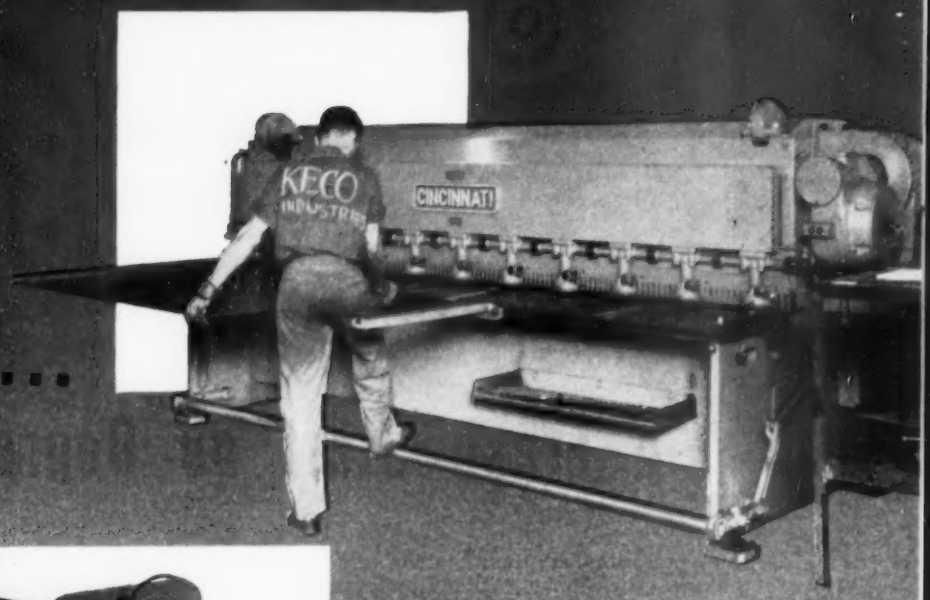
Modernization thus would be helped by a law such as the Frear Bill establishes. The results should be beneficial to everybody—the individual manufacturers and the nation as a whole.

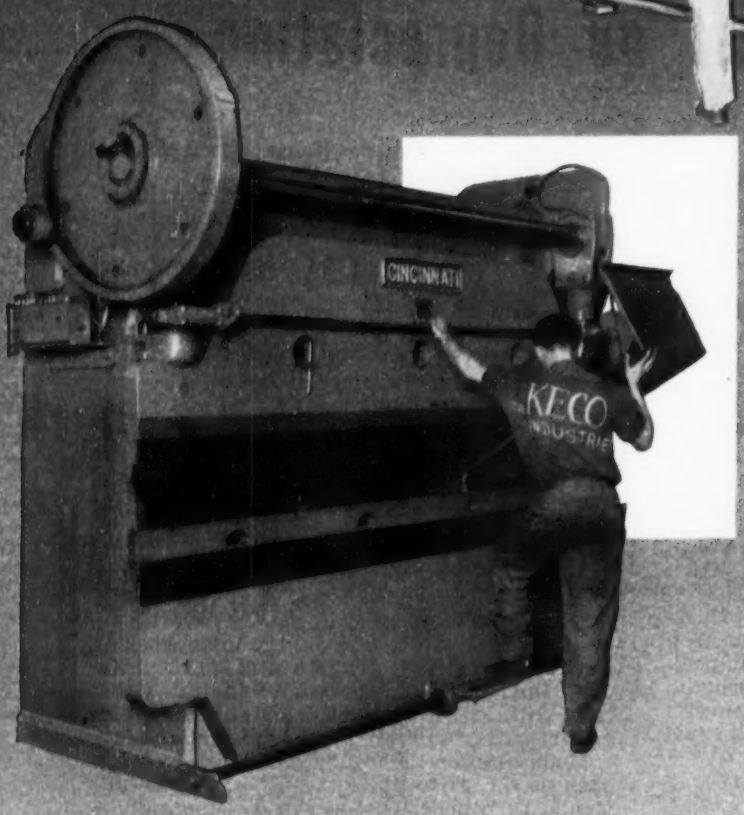
"We cannot stress too strongly," the recent Vance Committee report states, "the necessity for keeping the US industrial machine unimpaired and for keeping production equipment modernized and in a state of readiness (for defense production)."

Let's quit living with an obsolete depreciation set-up and start afresh with the principles embodied in the Frear Bill.

Burnham Finney

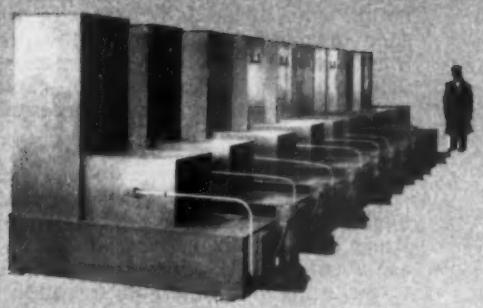
3 times as fast...





Photographs courtesy of the Keco Industries, Cincinnati 25, Ohio

with this CINCINNATI team



Cooling towers for portable air conditioning units

The floor-to-floor time consumed in shearing and forming panels for air-conditioning units, was cut from 12 minutes to 4 minutes at Keco Industries, using a Cincinnati Brake and a Cincinnati Shear.

Accuracy and rapid handling effected these savings.

In your shop, there may be opportunity for real costs reductions. Investigate Cincinnati Shears and Cincinnati Press Brakes.

Write for Cincinnati Shear Catalog S-6 and Cincinnati Brake Catalog **B-4A.**

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TYPEWRITER PLATE SEGMENT, as received from foundry (left). Semi-finished piece (center) after turning, cutting apart, and milling, drilling, counterboring, and tapping on a transfer machine. Finished part (right) after slotting for type bars

HOW TO ORGANIZE PRODUCTION PROCESSES

Transfer machines and other automatic equipment can be profitably applied to small parts in limited production, provided each job is properly studied . . . Here is how Olivetti applies the technique to typewriter building in Italy

BY AGOSTINO SANVENERO, Chief Tool Engineer • ING C OLIVETTI & CO S. p. A. IVREA, ITALY

In the business-machine industry, the most expensive parts are those made from castings, because of the many machining operations involved. Therefore, when we initiated a new-model program, we focussed attention on these parts in an attempt to reduce the number of operations, even at the cost of making them more complex.

As a result, we have been able to get out production with a limited number of working lines and with fewer machines, have simplified the flow of parts, and achieved higher efficiency.

In setting up the new production lines, we decided to:

1) Regroup as far as possible parts similar in shape and operations, to permit them to run together and thus reduce the number of lines.

2) Adopt the most modern and efficient machines for the longest operations.

3) Use older reconditioned machines for shorter operations.

4) Reduce feeds and speeds, on all except long operations, to obtain maximum tool life and minimum down time.

5) Make adequate provision for chip removal, by suction, for cast iron, and furnish adequate coolant tanks when machining aluminum.

6) Arrange the lines so work can pass from operation to operation, including inspection, with minimum handling by operator, who usually runs several machines.

Because of increasing production and the ever-rising cost of labor, a new approach had to be taken in the primary planning of the production lines. Our studies of machines, tools, and operations were based on the following principles to permit increased production efficiency for minimum capital.

1) Consider special-purpose machines, rather than adapting existing, standard machines.

2) Perform as many operations as possible on the same machine, compatible with easy machine and tool maintenance, except for operations which take only a little less than the maximum allowable time, based on a production of 50 machines an hour — the maximum foreseeable production.

3) Keep machines as small as possible, to cut down operator movement from machine to machine.

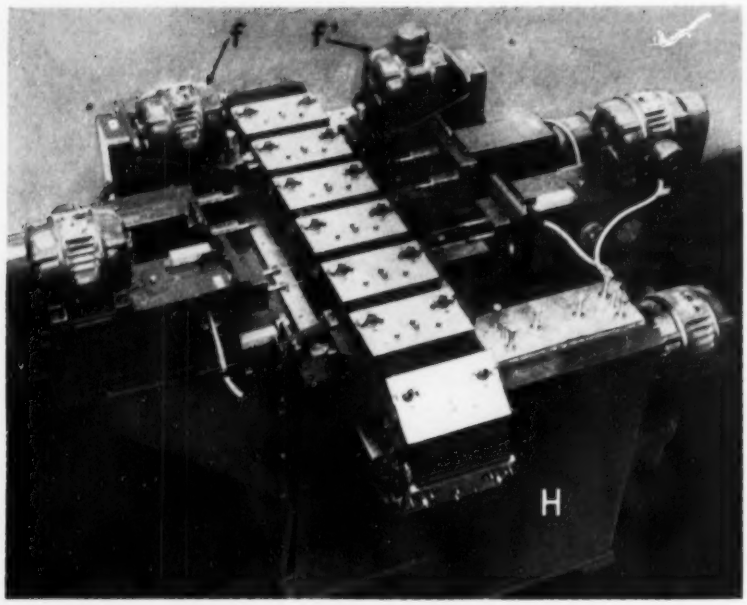
4) Mechanize all work clamping and unclamping, providing safety devices for machine and operator.

5) Transfer and index work automatically, where possible, and eventually include automatic clamping and ejection.

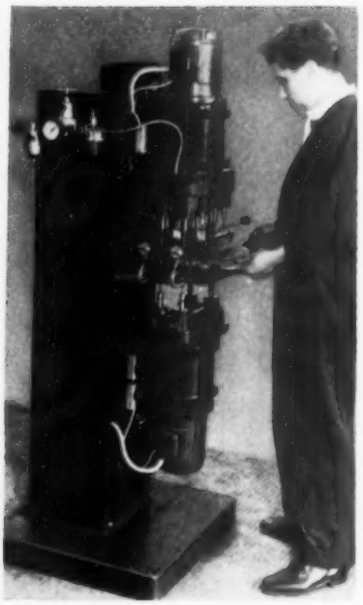
6) Use standard units as much as possible, such as electro-mechanical or electro-hydraulic drilling, threading, and milling heads, and separate panels for electric controls to facilitate design, construction, and maintenance.

7) Use weldments for machine bases and housings because they permit more complicated forms, permit changes in the course of construction, and are cheaper to manufacture because only one or two of each model are built.

Studies of an individual part should not be confined to a single



TRANSFER MACHINE with upper bridge and housing removed to show horizontal drilling and tapping heads and hydraulic milling heads f and f^1 equipped with vertical feed. Machine is fully automatic but can be manually cycled when production is low



MULTI-SPINDLE drilling and reaming machine for second operation. Drills operate upward, reamers downward

operation or group of operations and the necessary machines and fixtures. Instead, they should embrace the entire production process, including motion study, work handling, inspection, delays, grouping of machines for each worker, and operator work load.

A study starts with a check of the present method, using a regular flow process chart to give a picture of the distance covered, in feet, and the number of working stations, as well as the time required for each operation. Schematic drawings indicate the operations to be performed by each machine or group of machines.

The office of Cycles and Methods studies these charts on the basis of its own experience and that of shop supervisors, and the surveys of the time-study department. And on the results of these studies is based the decision to design special-purpose and multiple-operation machines.

An example of how this works is in the case of the typewriter segment shown in an accompanying illustration. This part was already in production, using modern (1947) setups, and it seemed, at first, that no great improvements could be made, and that it would not pay to re-examine the production process even though, in the meantime, there had been a considerable increase in production.

However, the need to set up a similar line in another plant, with lower production, suggested a thorough study to see if it would be worth while to maintain line production, and whether some of the existing machines could be shifted to the new plant and replaced by higher production tools.

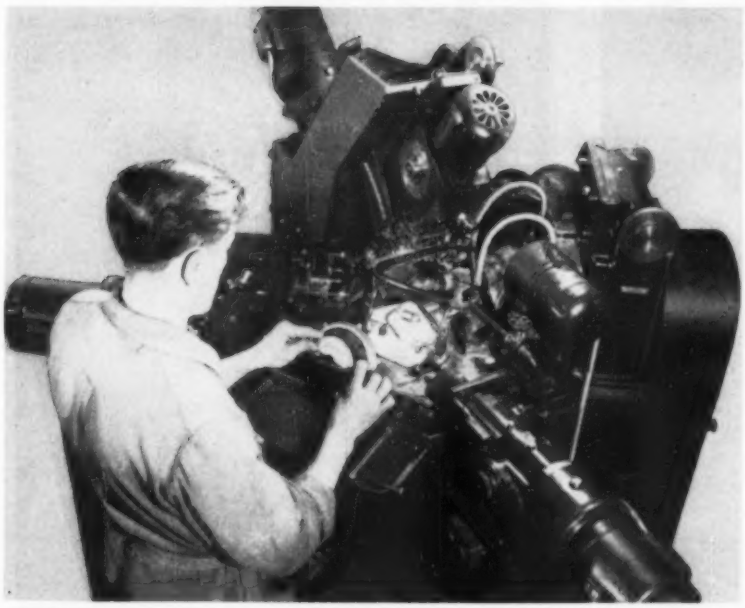
Process charts were made up for the old and the proposed new methods, and it became clear that the following improvements could be made:

	Old	*New*	*Diff*
No. machines	22	14	–8
No. operations	25	14	–9
No. handling	22	14	–8
No. delays	6	5	–1
No. inspections	11	8	–3
No. workers	5	3	–2
Length of line	96 ft	63 ft	–33 ft

These results were obtained by:
1) Study of new multiple tools for turning, thus reducing the number of lathes from four to two;
2) substituting a two-spindle drillpress with multiple-spindle heads for two, single-spindle machines with multiple-spindle heads;
3) replacing one milling machine, two multiple-spindle drills, and one three-head, multi-spindle special tapping machine, with a new transfer machine that automatically performs five operations;
4) replacing eight slotting machines—which had to work extra shifts to meet production — with five double-head machines.

The feature of the new line is the transfer machine which replaces four machines and five operations and saves one operator. Its cost was no more than that of the total cost of the machines saved, although a shorter depreciation period must be taken into account, because it is a special machine. On the other hand, many of the basic elements, such as heads, pumps, and controls, could be re-used if the model changed.

The machine is typical of the new concepts mentioned above, in that it was designed specifically for the job to give greater precision and uniformity; it performs the greatest practicable number of operations on one machine; and provides for easy maintenance of tools and machine. None of the



INDEXING-TABLE MACHINE for milling, drilling, and tapping segment plates. It has three stations with one double-spindle milling head, four drilling heads, and three tapping heads. Machine stops at end of each cycle, so one opeator runs the two adjacent machines in the line

operations is such that it would limit production of the line in case of an increase of production. In fact, the longest operation, milling, can easily be shortened to triple present production. The over-all dimensions are greatly reduced; all clamping, unclamping, and ejection controls are automatic; it is made up, essentially, of standard elements; and the various units of the machine body are assembled by welding.

Far from resembling the large-size transfer machine used in the automobile industry, this has a frontal length (excluding the electric control panel) of only 4½ ft and a weight of 4 tons.

This was achieved by using a continuous chain to locate the work, clamp it at each station, and eject it at the end of the cycle. This eliminates the necessity of clamping the work on a separate fixture which is then transferred and located at each station, and finally, after the work has been removed, returned empty by a separate conveyor to the loading station.

The idea of transferring the work on a separate fixture has been adopted by Renault in all cases, while the well-known American manufacturers, such as Cross, Baush, and Greenlee, employ it for small pieces only. For engine blocks or gearcases that have good locating and clamping surfaces, they transfer the piece itself and save the extra work.

In our case, neither work alone, nor fixture, are moved by pawl or drag link. Instead, the entire chain of units is moved forward one step.

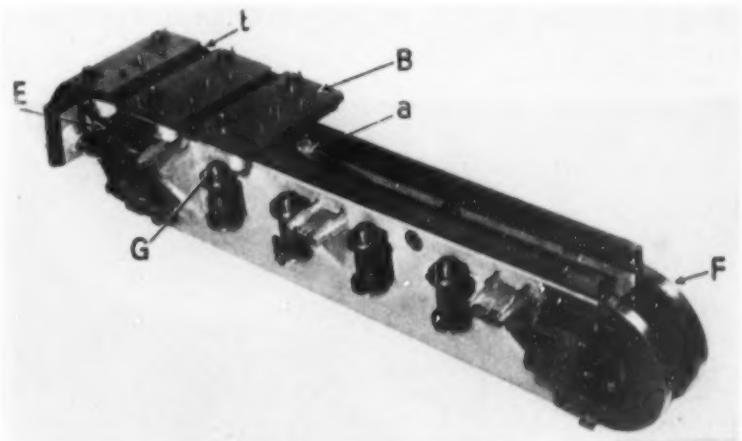
The continuous transfer chain is made up of 17 identical units linked together. Each unit consists of a fixed plate carrying a movable plate which is the actual fixture on which the work is located on suitable pins. This plate is guided on the fixed plate by posts, and positioned on the "bridge" by bushings at each working station. Cams operate ejectors to remove finished parts at the end of the machine. The fixed plates move on rollers between guide rails and the entire chain can be adjusted for tension by semi-circular segments at the end of the frame.

Movement of the chain is by rack and pawl, operated by a hydraulic piston. Hydraulic pistons at each station lift the movable plate and clamp the work between this and the fixed bridge which forms the top of the machine.

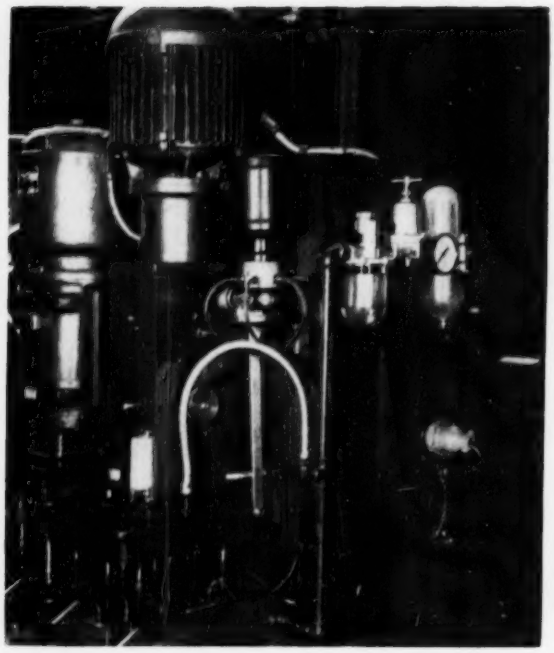
The machine bed is of heavy steel plate, and it, and all the other elements, are assembled by welding, and the bed is so designed and made that all locating surfaces can be finished by grinding.

Automatic controls are electrically operated, and all hydraulic cylinders are controlled by solenoid-operated valves. Each working head can be operated independently for setup purposes.

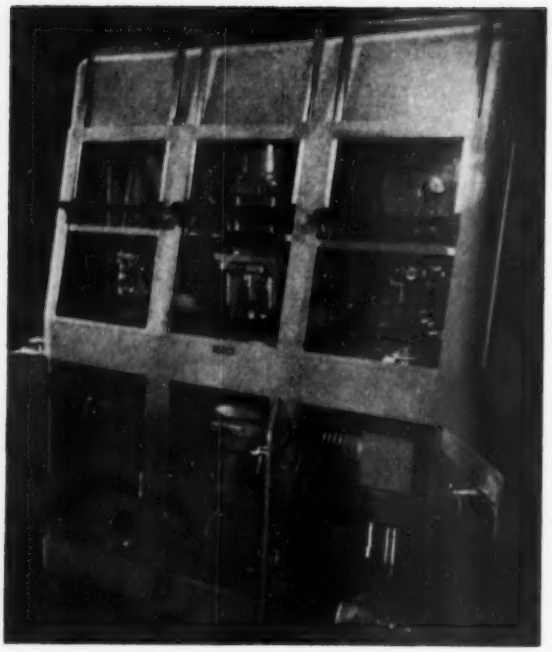
Machines of this type appear to be quite complicated, but they



RAIL SECTION of transfer machine with some plates in place. Transfer pawl *a* is operated by hydraulic piston located between rails. Movable plates *B* carry the work and clamp it against bridge when raised by hydraulic pistons *G*. Chain tension is adjusted by quadrants *F*. Ejection control cams are shown at *E*, and flexible guards at *t* to protect chain and rails from chips



TAP-GREASING SYSTEM (black tank near motor) is operated by pump feeding metered amount of grease at each return stroke of machine head. Grease feeds to bushings through which taps pass on down stroke. Oil-mist system (upper right) lubricates tapping head and other parts of machine



TRIPLE MACHINE is made up of two vertical lathes with multiple tools, and a vertical drilling and reaming machine with two multi-spindle heads. Doors open automatically when piece is finished; closing doors starts the machine

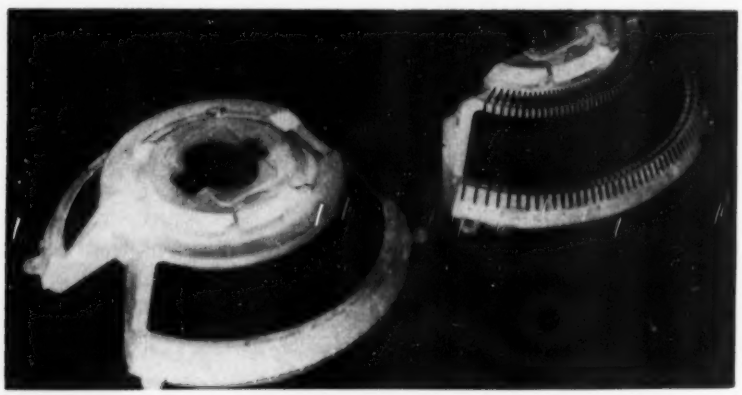
can actually be designed and built quite quickly. Once the general design has been settled, separate groups of designers can work on the major components, such as, unit heads, transfer unit, hydraulic unit, frame, and controls.

As the work is done dry on this particular machine, chip collection is important. This is performed by enclosing the chain in sheet-steel guards and removing the chips by suction at several points. The upper locating surface is cleaned by brushes during the transfer operation, and the locating dowels for the work-carrying plate are made of nonmagnetic material to prevent chip adhesion.

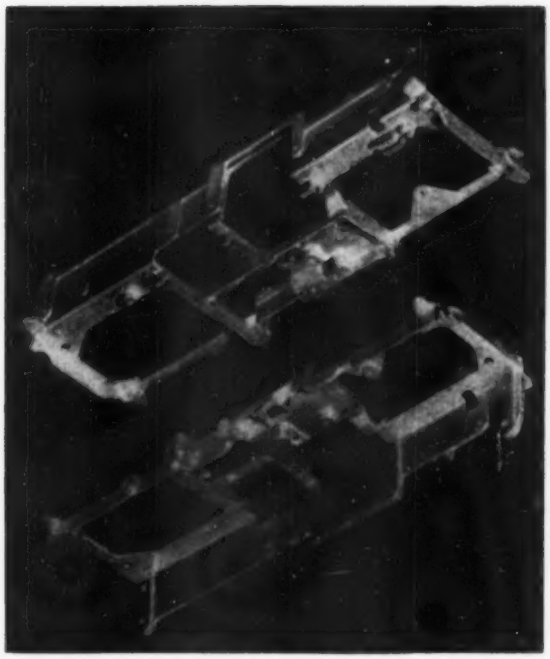
The tapping unit is the only part requiring a cutting compound, and this is furnished by a Bosch pump. At each return stroke of the tapping head, a small amount of grease is squirted on the taps through pipes connected to bushings through which the taps must pass on the next forward stroke.

Another interesting production job is performed on the segment plate for a portable typewriter—an aluminum alloy die-casting. The production line is made up of a triple machine for turning, drilling and reaming; a production milling machine for cutting the work into two parts; an indexing-table machine for milling, drilling, and threading; and several special automatic milling machines for cutting the 43 radial slots.

The triple machine consists of three special units mounted on a common base. The first is a vertical, automatic lathe with multiple tools controlled by cams on a drum; the second is a multiple-spindle drilling and reaming machine with one head operating downward and another operating upward; the third is another vertical, automatic lathe with cam-controlled multiple tools, and is equipped with a special device for



SEGMENT PLATE for portable typewriter is cast in one piece (left) of special aluminum alloy. First three operations are performed on triple machine, then parts are cut apart before final operations



FIXED GUIDE for portable typewriter carriage—top and bottom views—has large number of holes to be drilled, reamed and counterbored but could not be handled economically on transfer or index machine. A multiple machine is the answer

MULTIPLE MACHINE is really four machines on a common base and has seven vertical and three horizontal heads for all drilling, reaming, and counterboring operations on typewriter carriage guide. Transfer is manual, but clamps are pneumatic

cutting the octagonal seat for the type-bar pin.

The work is moved manually from station to station, and the three units are independent so the operator can load one while the others are in operation. Pneumatic clamps are employed, and feed starts automatically when the guard doors are closed. Automatic opening of the door stops the machine at the end of the operation. Soluble oil is employed for cooling, and special care had to be taken to shield the lower spindles on the lathes and drilling heads by tanks and seal rings. Cutting fluid flow is controlled by solenoid valves so it occurs only during the cutting cycle. Fixtures are cleaned by a powerful spray of cutting fluid, manually directed as needed. Tip-over bins in the base of the machine permit easy chip removal.

The third machine is of the indexing-table type, with three stations and seven independent heads. It performs two milling operations on different surfaces, and all drilling and tapping operations in four different directions with only one setup.

Indexing is performed by a motor-driven Geneva mechanism, with exact location provided by a wedge. Electric controls are interlocked so the table cannot index until all heads have completed their cycle. If more stations are needed, indexing can be performed by hydraulically operated pawls and an electric servo-mechanism in the control system, as in the case of the transfer machine.

Generally speaking, the indexing-table machine is more economical and simpler than a transfer machine, but it is not always possible to machine a piece on such a machine with only one setup and with multiple stations. To decide which type to use, it is necessary to study each individual case, and sometimes the cost and complexity are such that it is preferable to employ multiple machines with manual transfer. This was the case with the triple machine mentioned above, where it is obvious that automatic transfer from turning to drilling, then to turning again, at three different locations, was not practicable.

In other cases, although automatic transfer might be quite feasible it is not always convenient—either because it would require too large a table for such short operations, or because it would involve dividing the operations among two or three larger and more costly machines.

An example of a multiple machine is the one employed for drilling, reaming and counterboring the fixed guide of a portable typewriter carriage. In this case, operations must be performed in five different directions, and some of the holes are so closely spaced that they cannot be drilled in the same jig. Some of these must therefore be drilled at a separate operation, or drilled from the opposite side with a separate head.

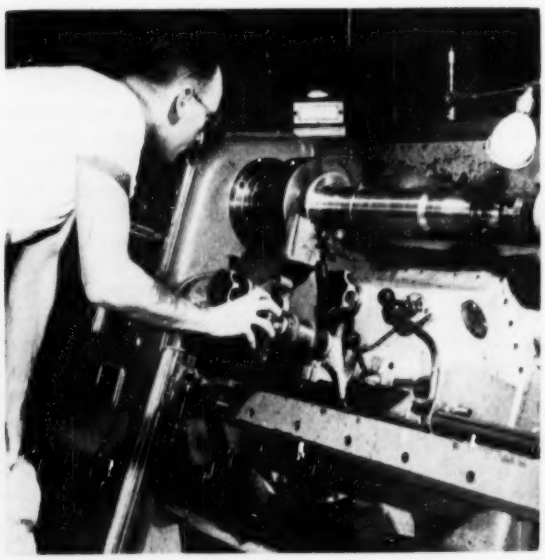
It is actually four machines mounted on a common, welded base and equipped with ten heads. This is a typical solution to the problem of multiple machines for small pieces where it is more important to reduce the work of the operator in handling the work from one machine to another, than to provide automatic transfer at higher cost.

PRECISION GEARS for reciprocating and jet engines are carefully inspected before first engine tests are made. After satisfactory test performance, engines are disassembled and all parts, including gears, are inspected again

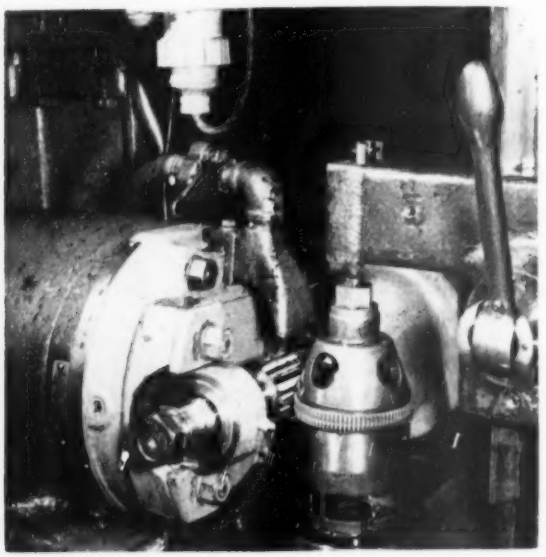
AIRCRAFT GEARS... FAST, ACCURATELY, AND AUTOMATICALLY

Precision, high strength, and high production are aircraft requirements. Methods on gears for turbo-jets and reciprocating piston engines are here described

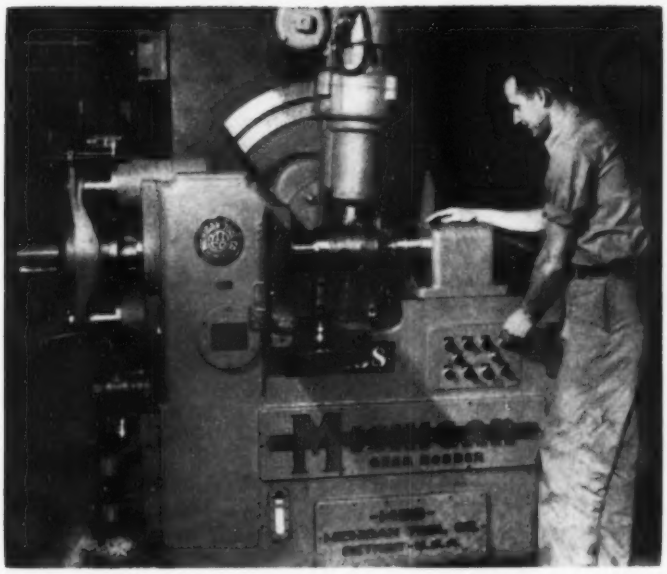
BY EDWARD TUCKER, Supervisor, Process Planning, Gear Production, PRATT & WHITNEY AIRCRAFT, East Hartford, Conn



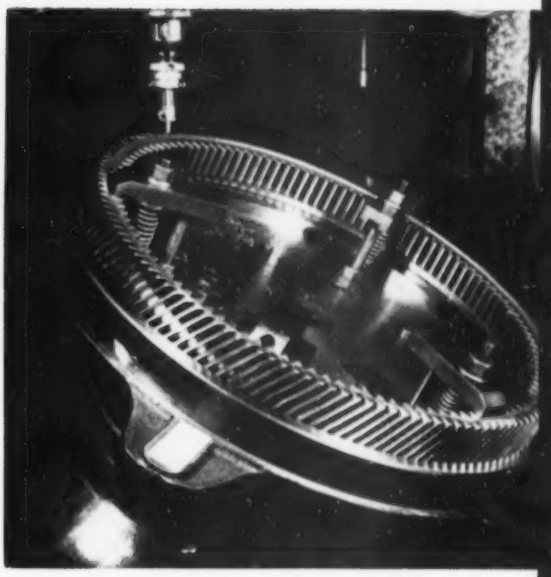
CONTOURS OF SHAFTS with integral gear or spline teeth for impellers, accessories, tachometers and other engine parts are turned in copying lathes like this hydraulically controlled Fischer machine. Gear teeth are produced in shapers and hobbers at high production rates to satisfy aircraft requirements



SPLINES ARE ROUGH HOBBED two at a time in this Cleveland machine. Automatic hob shifter, controlled by a limit switch, eliminates operator's tendency to stretch hob life because it automatically presents new teeth to the work when teeth in use get dull. When the last set of teeth are reached, a red light flashes to signal for a tool change. Better quality work results and hob life is increased because wear in each pair of hobs is the same



TWO GEAR BLANKS are rough hobbed back to back from AMS 6260 steel forgings to make rear timing gears for piston engines. Late-model machine provides high production rates and accurate work

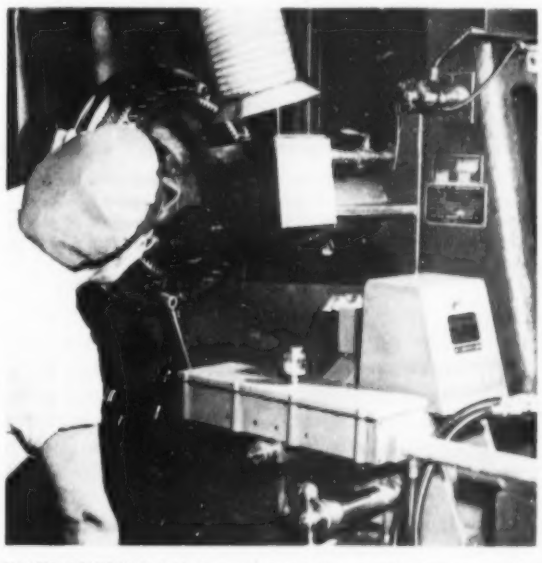


LARGE RING GEARS, produced at a rate of 2 to 3 per hour in hobbers, are then chamfered in a Cross machine

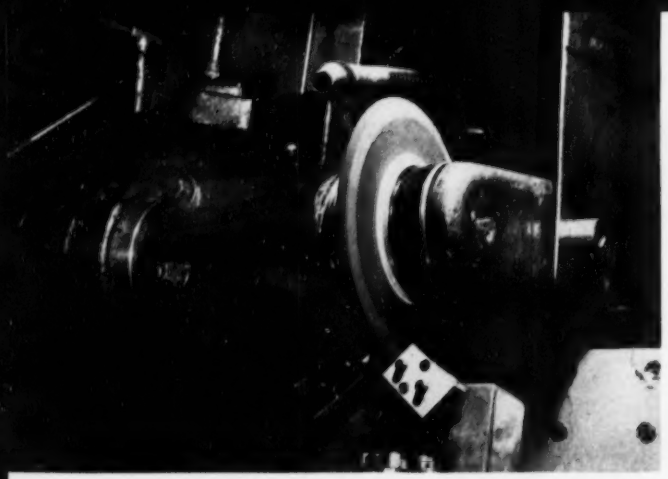
Up-to-date production equipment and methods solve Pratt & Whitney Aircraft's gear-making problems. Relatively lightweight gears for starters, vacuum pumps, cam, generator and accessory drives and many other engine components must all carry heavy loads. Most are made of AMS 6260 steel, 80% being made from forgings, the balance bar stock.

Automatic chucking, and automatic turret lathes do turning, boring, facing, and forming of smaller blanks. Usually one operator runs two machines. For these parts, made in relatively small quantities, higher spindle speeds are empoyed and high production rates are obtained. Impeller, accessory, tachometer and other shafts with integral gear or spline teeth are turned between centers in Monarch "Mono Matic" air-tracer contouring lathes or in hydraulically controlled Fischer copying lathes. Other parts are chucked in Warner & Swasey single-spindle and Bullard multi-spindle automatics. Gear-tooth forms are produced in late-model Fellows shapers and Cleveland and Michigan hobbers. Now two to three of the larger gears are produced per hour as compared with six per day made on older machines. In grinding gear teeth, great care is taken to use wheels of the correct bond, grit size, and hardness for any particular machine. Moreover, wheel speeds, feeds, and coolants are closely controlled.

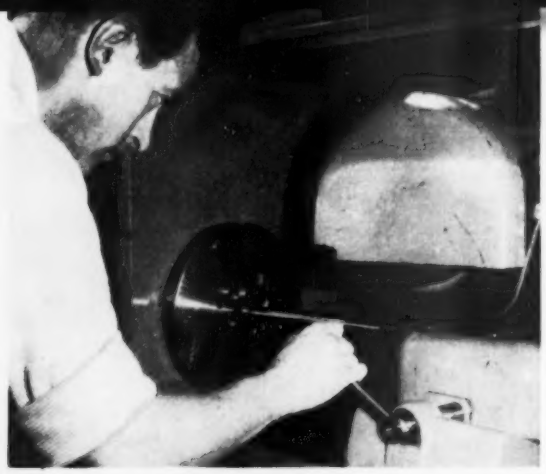
Numerous late-model gear grinders are employed, each having particular advantages for specific applications. A new Swiss Reischauer machine, for example, employs the hobbing principle, eliminates indexing and is extremely accurate. A "Geargrind" machine, almost as fast, can handle work that cannot be done in the Reischauer grinder, which is limited to gears that can be mounted on arbors and ground with a 13 in.-dia wheel. Gleason machines are used for grinding "zerol" gears, (curved-tooth bevels with zero-degree spiral angle) which combine the low axial thrust of straight bevel gears with localized tooth contact of curved-tooth spiral bevels. These are used as accessory drive and reduction gears in both turbojets and piston engines. The Gleason grinder



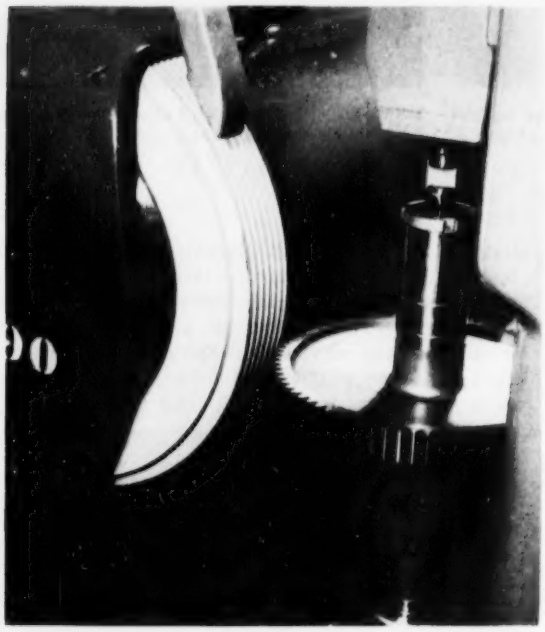
FINISH GRINDING 105 internal teeth for a reduction gear after rough hobbing, chamfering, and heat-treating. Hoglund automatic wheel dresser on this Geargrind internal grinder speeds production by automatically dressing wheel after a pre-set number of teeth have been ground



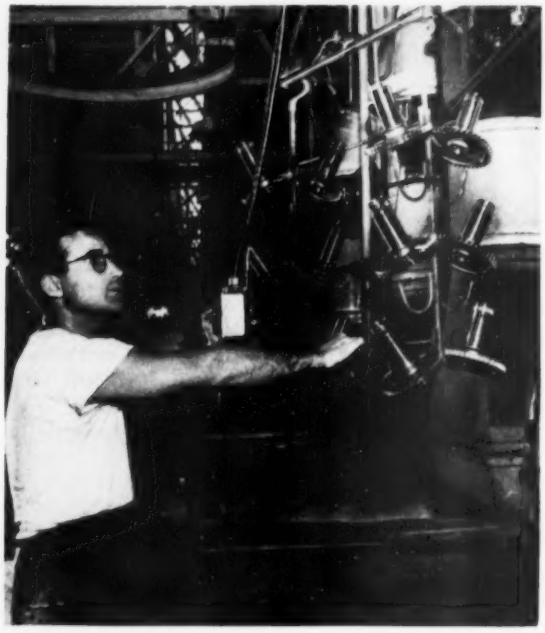
CLOSE-TOLERANCE GEAR GRINDING is provided by Hoglund dresser which automatically dresses wheel before gear-tooth form breaks down. Dresser is operated by hydraulic circuit on the grinder—has templet and follower to actuate diamond against wheel



EXTERNAL SPLINES are finish ground in new Geargrind external gear grinding machine—also equipped with Hoglund automatic wheel dresser to provide good blend at junction of fillet and involute curve. Part is 1⅛-in. dia, AMS 6262 steel accessory drive shaft for J-57



CONTINUOUS GENERATION in gear grinding is provided by Reichauer machine where gear teeth on supercharger driveshaft are shown being finish ground between centers. Feed is automatic for rough cuts, manual for finishing. Machine eliminates indexing and is highly accurate—tooth spacing being held within 0.0001 or 0.0002 in.

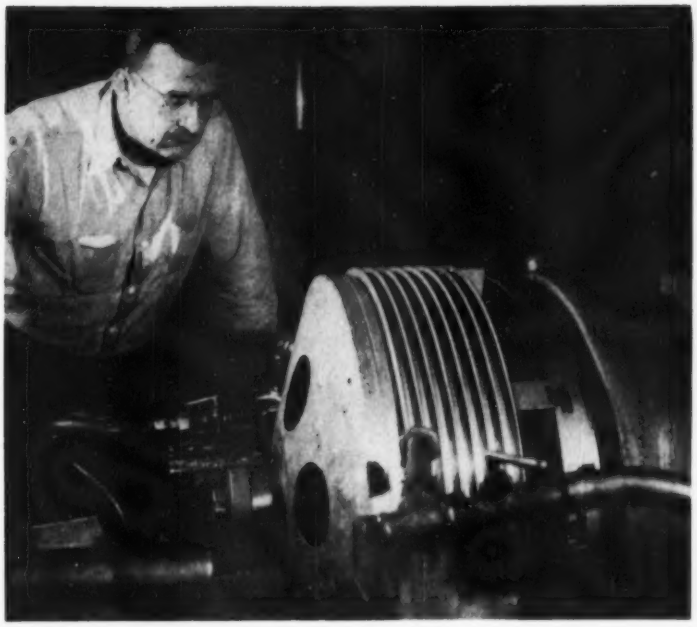


ALCOHOL AND NITRIC ACID TEST is given all ground gears to etch surface slightly. This produces a gray matte finish except where superhard areas—caused by burning in grinding—produce white spots. Soft areas appear black. Test shows up defects not ordinarily caught in magnetic inspection

is nearly fully automatic, has automatic wheel-dressing equipment that controls the number of passes between grinds and can be used for grinding spiral bevel and hypoid gears as well as the zerols. Another gear grinder used in this plant is the Pratt & Whitney wheel-generating type rather than the formed-wheel type.

An especially interesting device that increases gear grinding production with high accuracies is an automatic Hoglund wheel dresser attached as an integral part of several Geargrind and Fitchburg machines. Operated by the grinder hydraulic circuit, this dresser employs a templet and follower to actuate a diamond against the wheel. Important fillet radii are held to close tolerances—the wheel form for this section being dressed by the same diamond that produces the involute curve. Perfect blends are achieved at the junction of the fillet and the involute as a result. Moreover, modifications in involute forms, occurring more and more often as the result of gear-design research, are easily made with only simple changes in the templet.

With large ring gears having 115 teeth from which approximately 0.020 in. stock is to be removed from a side, the wheel may be dressed automatically as many as eight times.



SHEAVES ARE MOUNTED on a central drawbar and forced back against the jacks on the faceplate by 90-psi air pressure. To prevent slippage, jacks were slotted and sharp carbide inserts added. Instead of friction alone, inserts cleave surface; provide positive drive

JACK, OR CHUCK JAW, is slotted, insert is placed, and slot sides are peened over. With this trick there was no more slippage, tool life increased, and scrap was reduced

CARBIDE INSERT MAKES SIMPLE WORK-DRIVER

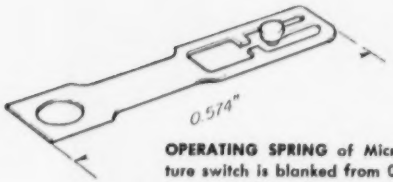
Brinelling drives are becoming increasingly popular as a rapid means of loading and turning lathe work. Here is a simple trick for using this technique.

V-BELT sheaves being grooved on turret lathes at Allis-Chalmers Manufacturing Co were continually turning and slipping on the faceplate; hence causing considerable time and material loss. These sheaves were held against serrated faceplate jacks by a pressure plate operated by a drawbar connected through the lathe spindle to a revolving air cylinder actuated by 90-psi pressure. Even with light feed and increased holding pressure, the sheaves slipped; caused tool breakage, pin shearing, and rework.

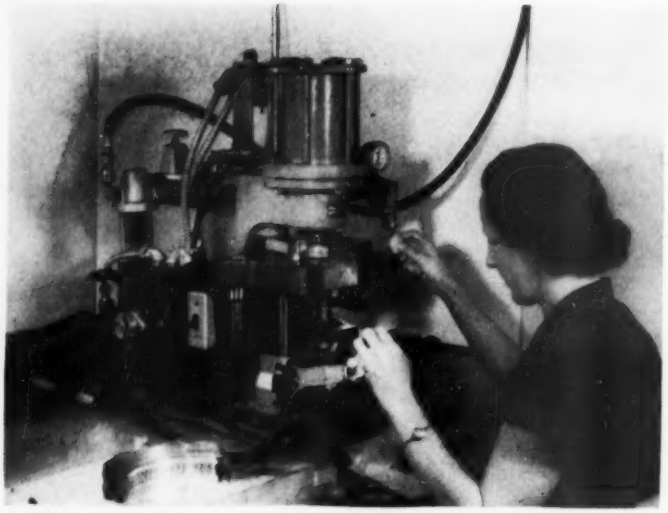
Joe Terek, a setup man at Allis-Chalmers, removed one of the six jacks, cut a V-groove in its face, and inserted a piece of hardened hexagonal stock, allowing one of the corners to contact the sheave. When the sheave is forced against the jacks, these sharp corners seat (Brinell) themselves into the sheave face. The hardened steel proved so effective that a carbide tip was inserted into the contact face of the jack so it protruded about 0.030 in.

This setup has eliminated all slipping and makes unnecessary the use of drivers in web style and similar sheaves. Inserts are held in the slots by peening, but they may also be brazed.

air press assembles tiny switches



OPERATING SPRING of Micro sub-miniature switch is blanked from 0.003-in. thick heat-treated beryllium copper strip. Contact is pure silver, 0.042-in. thick



AIR PRESS automatically inserts and heads small silver contacts in strip of 20 subminiature switch springs in 20 sec. Press was designed by Micro tool engineers

500% increase in production results from automatic assembling of tiny silver contacts to 0.003-in.-thick springs

By P R ENZLER, Superintendent, MICRO DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

Micro sub-miniature switches now used in large quantities for military and civilian applications, have 0.003-in.-thick contact springs only 0.574 in. long, 0.144 in. wide. Riveted to each spring is a 99.9% pure silver contact with an 0.062-in.-dia head on one side, and a slightly smaller head, upset during riveting, on the other side.

The small size of the springs and contacts makes manual handling difficult, particularly if the parts must be handled individually. So the springs are left attached to scrap strips when blanked in a progressive die from heat-treated beryllium copper. Hardening precedes blanking to eliminate burrs.

After blanking in a 50-ton Henry & Wright dieing machine, the spring strip is sheared into 20-spring lengths for easy handling in subsequent operations. Spacing of springs, center to center, is 0.375-in. At each end of the springs, the strip is serrated half way through, to facilitate breaking the springs away from the scrap strips as springs are assembled to switch bases.

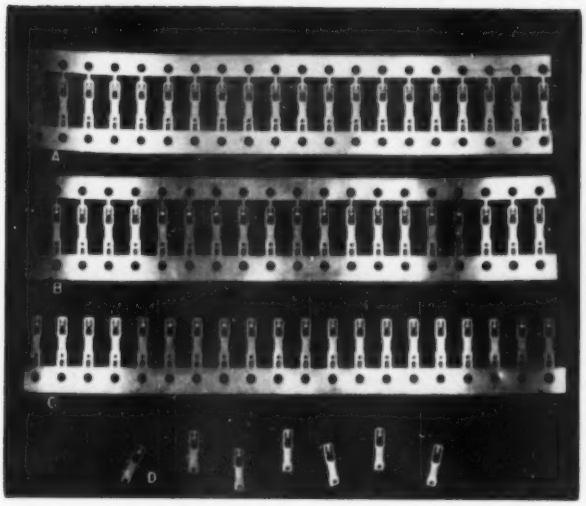
Fitting and riveting of the silver contacts to the spring blanks originally was done manually. The operator positioned the contact with tweezers, then headed the small end with a hand set and hammer. Even with the springs in strips, however, only 450 springs could be completed per hour.

To eliminate this bottleneck, Micro developed the automatic benchpress shown. With a strip of 20 springs in place, and the small hopper full of contacts, this press will assemble one spring per second —and loading time is limited only by the dexterity of the operator. Production per operator now is six times former output, and accuracy of contact head size and contour is materially improved.

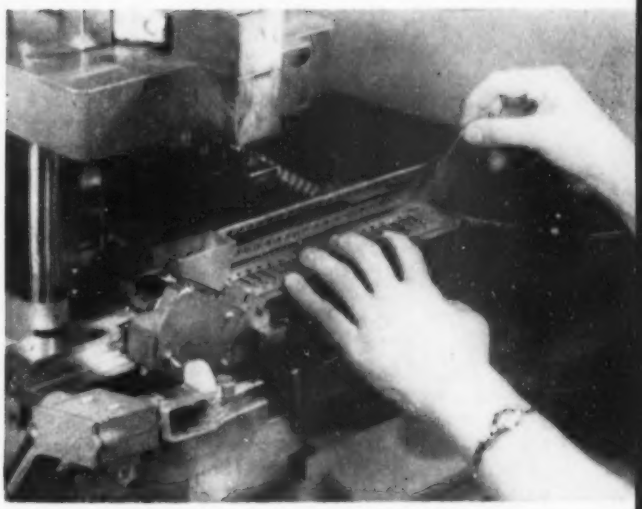
Essentially, the press is a combination of a standard air press, a commercial die set equipped with an automatically advanced ratchet-controlled slide, a magazine-equipped automatic rivet feeder, and a self-repeating control circuit which insures that each contact is headed to a preset pressure. Until the work-holding slide reaches the end of its feed stroke and contacts a limit switch to shut down the machine, the press will continue to feed and recycle as long as the operator depresses the control switches.

A hopper feed small enough to handle the very small and very light silver contact rivets could not be found, so one had to be designed and built. This hopper did not work satisfactorily until a vibrator coil was employed. Controlled by a switch actuated at frequent intervals by a small synchronous motor, the vibrator shakes the hopper and keeps the rivets from "bridging" over the end of the guide tube in the feed mechanism.

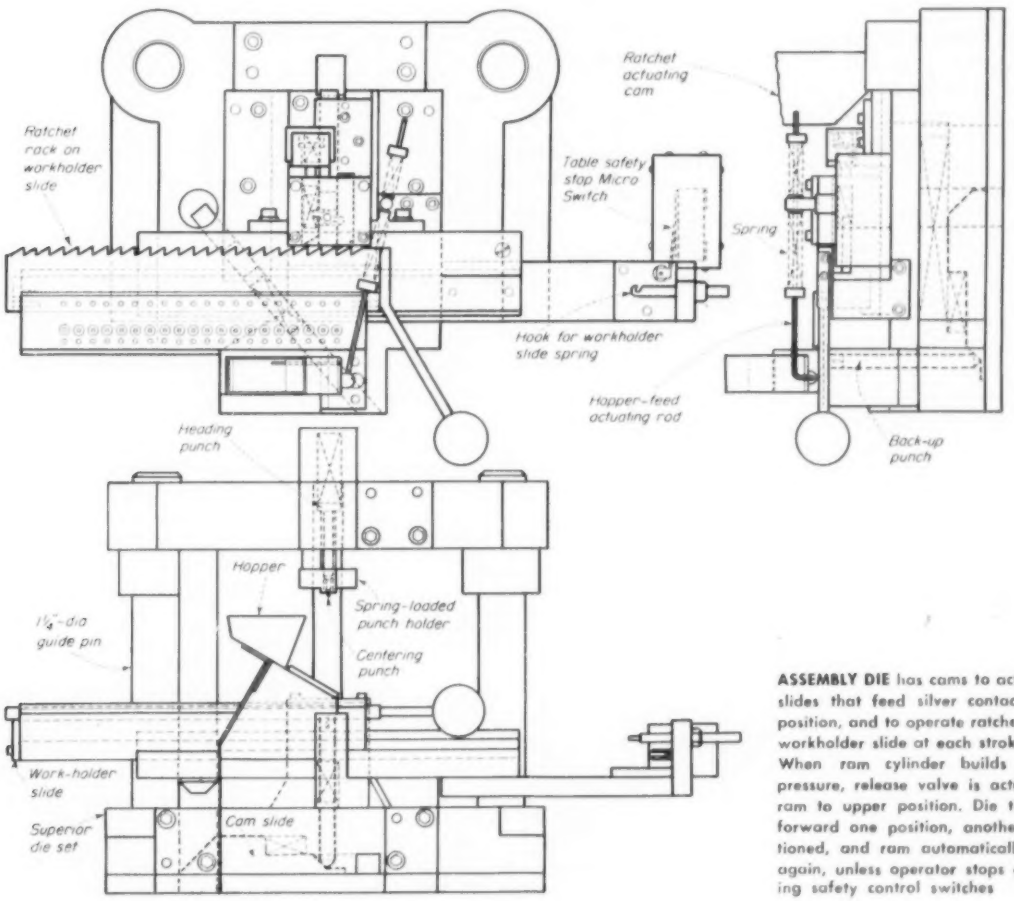
A silver rivet is dropped head down from the guide tube into a transfer slide at each stroke of the press. It then is moved over under the heading punch and is lifted by the backup punch to insert its 0.028-in.-dia shank through the 0.031-in.-dia rivet hole in the switch spring. Heading and backup punches are cupped to form 1/16-in.-radius heads on both sides of the spring and are controlled by the actuating mechanism to hold contact thickness within 0.002-in. of the 0.042-in. specified. This is important, as the switches are single-pole, double-throw, and operate with minimum control motion in either direction.



DEVELOPMENT OF SPRING is in four stages: (*A*) strip from progressive die: Scrap strip on both sides holds springs in alignment during subsequent operations. (*B*) After air-press operation: Contacts are assembled. (*C*) and (*D*) at assembly bench: Scrap strip across spring heads is removed, (*C*). Spring strip is fed through small fixture with forming lever that simultaneously breaks all 20 switches loose from the remaining scrap strip, (*D*)



ASSEMBLY OPERATION is automatic except for loading spring strips. Operator positions strip, lowers cover plate (right hand), and grasps large handle to move workholder slide to the left as far as it will go. She then depresses two safety switches to initiate the automatic press cycle. Cover plate has clearance holes for centering punches that locate slide as ram descends



ASSEMBLY DIE has cams to actuate horizontal slides that feed silver contacts to assembly position, and to operate ratchets that advance workholder slide at each stroke of press ram. When ram cylinder builds up to preset pressure, release valve is actuated to return ram to upper position. Die then feeds strip forward one position, another rivet is positioned, and ram automatically moves down again, unless operator stops cycle by releasing safety control switches

What are significant features of

BY PAUL H PRIKOS,
Chief Tool Engineer,
WEILAND TOOL & MFG CO, CHICAGO

FROM building an assortment of shaving dies in the past two years, we have learned some of the features that successful tools of this category must possess. This experience has come to us, as a member of the National Tool & Die Manufacturers Association, because we must serve customers with dies that are varied in design and construction. Therefore, the design principles followed have been proved by actual practice and can be used to advantage elsewhere, even though we do not claim to have built every possible type of shaving die.

Shaving-Die Definition — We consider a shaving die to be one that cuts away a small amount of metal from the whole, or some part of, the periphery of a metal stamping. Normally, the width of the shaving does not exceed 10% of the stock thickness (anything more is considered trimming, not shaving), and our shaving allowances are normally less. For soft steel we specify 6% of stock thickness; for hard steel, 8%.

A shaving die, moreover, differs from a trimming die, in that close workmanship and accuracy are essential between the punch and die members. In most cases a shaving die has a spring pad to hold the piece part. Punch and die components are commonly made of a

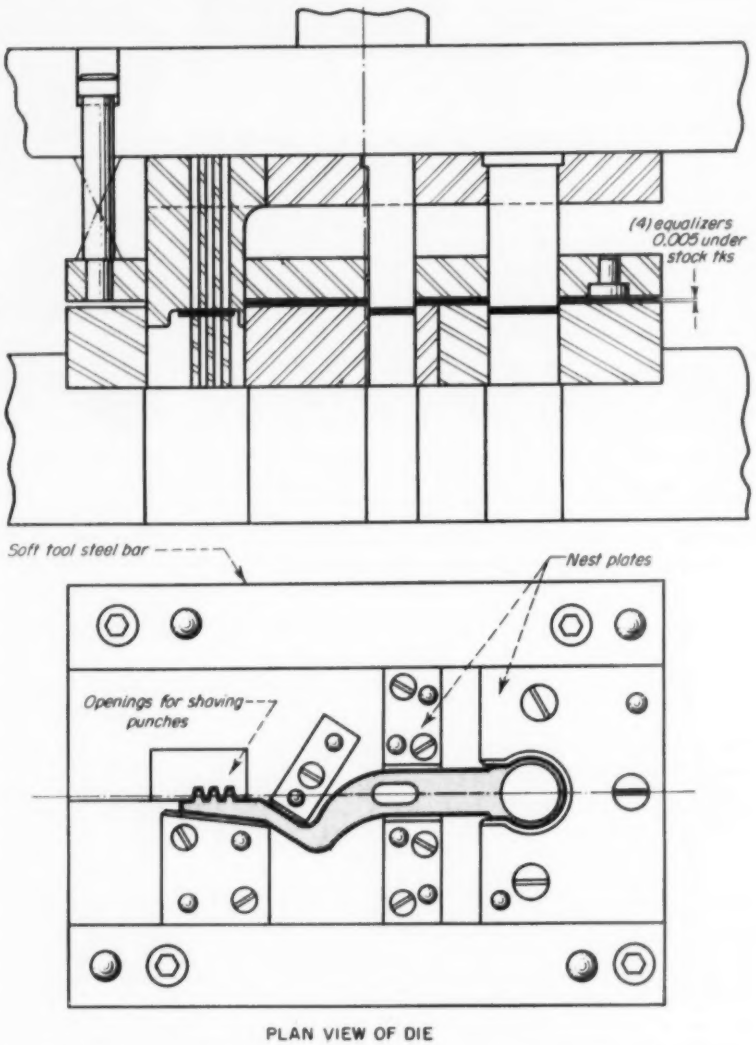


Fig. 1—Good shaved parts require a minimum of 75% shaving of the specified edge areas. Success of the shaving die in this instance depended upon a compound blanking and piercing die made so accurately that only 0.004-in. shaving stock would be allowed, other tolerances being non-accumulative

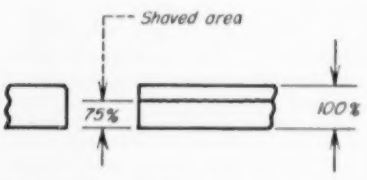


Fig. 2—To secure a 75% shaved area is not easy for the diemaker

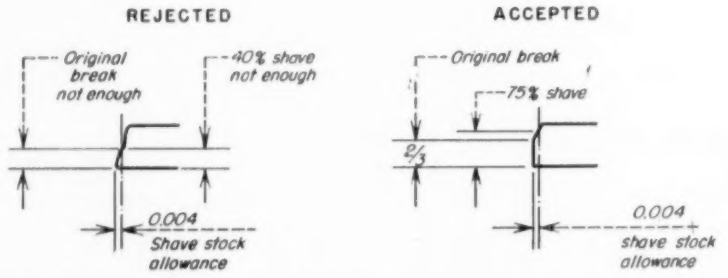


Fig. 3—Clearance between punch and die must be as close to a slip fit as possible, in order to get a break that will permit 75% shaving with the shaving allowance provided

Shaving Dies?

good tool steel, hardened, and mounted on a leaderpin die set. When more than 10% stock thickness is removed, the operation is considered to be a trim, and the die a trimming die. Fundamentally, the difference is: (1) More metal removed, and, therefore, less accuracy is required, and (2) the break on the piece part again takes on the irregular appearance of a blanked part.

Comparison of Blanks

Before going into detail on shaving-die construction, let us examine the profile of a shaved part and compare it with an ordinary blank. This analysis will help us to understand why certain precautions are taken in allowances and clearances in the design and building of shaving dies. In Fig. 1 the piece part shown in the plan view is made with a compound die and a shaving die. The latter removes material around the rack-tooth section, the elongated slot, and the large hole at the opposite end. Material specifications of the piece part are chrome-nickel steel, half hard.

Our client required that the critical shaved portions have a minimum of 75% shaving in those areas, Fig. 2. Most good shaved parts have this requirement. Usually a 100% clean profile requires two shaving operations (always remember to reverse the blank) or even a burnishing die.

Success of the shaving die in this case depended on the accuracy of the compound blanking and piercing die. The latter was designed to allow only 0.004 in. shaving stock, other tolerances being non-accumulative. Clearance between the punch and die was held on the tight side, thereby assuring a proper break for any successive shaving operations (Fig. 3).

This die is of sectional construction. All punch and die members are oil-hardened tool steel with hardness of R. 60-62. Even the punch pad that holds two of the three punches is of tool steel, hardened to R. 56-58. Die blocks are set into the die shoe and straddled on two sides by soft tool-steel bars that act as a yoke to prevent the slightest shifting. All hardened parts of the die are ground, including dowel holes.

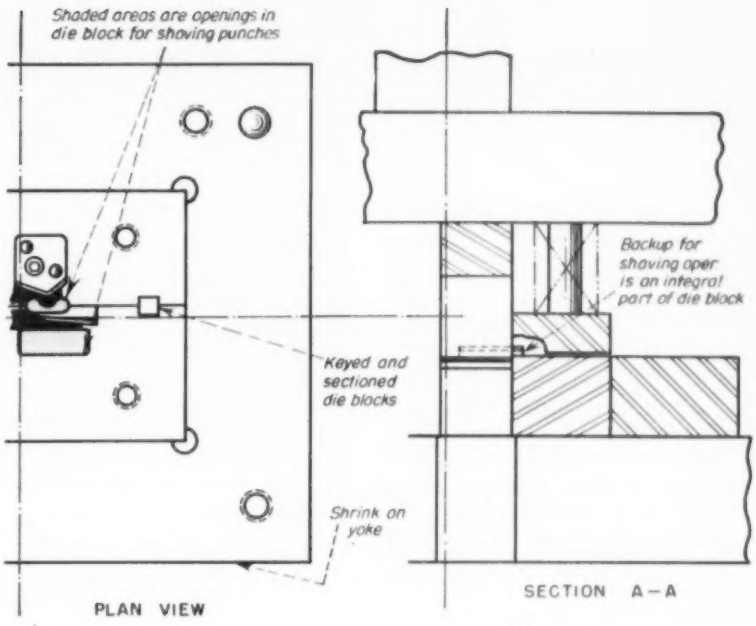

Shaded areas are openings in die block for shaving punches
Backup for shaving oper. is an integral part of die block
Keyed and sectioned die blocks
Shrink on yoke
PLAN VIEW
SECTION A—A

Fig. 4—When shaving must be done at two places and in close quarters, it may be impossible to use a solid combination nest and backup plate. In this case, the nest and backup are integral with the die block. All decimal dimensions were ± 0.002 in., non-accumulative, and maximum clearance between punch and die was 0.0005 in. The piece part from the companion compound die was used for fitting the nest and making certain that the shaving blended

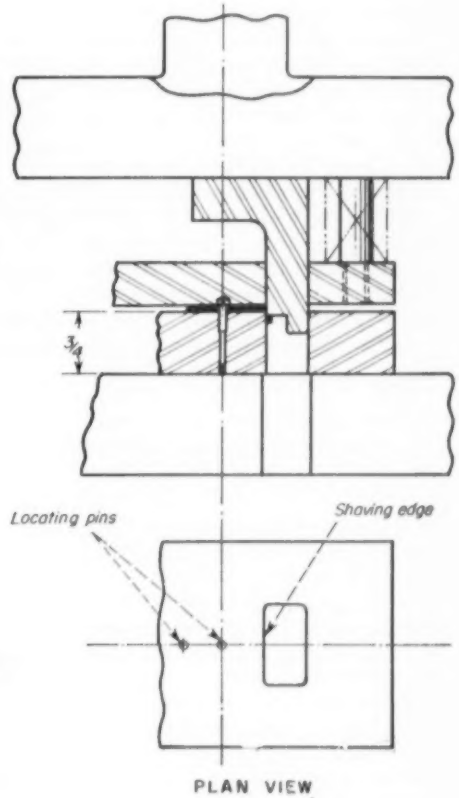


Fig. 5—Cheap shaving dies like this one, and expensive ones, have two points in common: very close clearance between punch and die, and little or no angular clearance

The piece part is located on the surface of the die blocks by nest plates (flat ground stock R. 58-60.) In this die, the nest plates act as locators and backups opposite shaving points, thus preventing lateral movement. Every shaving

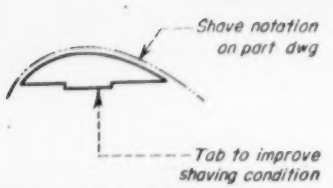


Fig. 6—A tab on the piece part, and located opposite a relatively large shaved area, helps to prevent movement from the nesting points

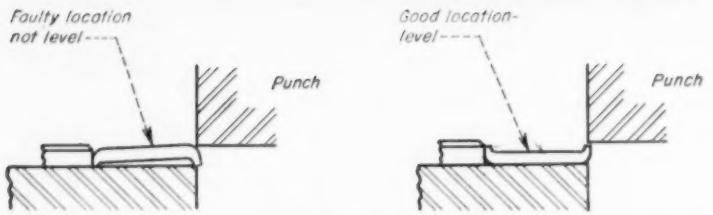


Fig. 7—An old rule, worth remembering, is to place the burr side up, so that the shaving punch will "bite" into the material, and so that the piece part will locate properly and be level

punch should be heeled wherever possible.

In another die, Fig. 4, shaving had to be done at two different places of a piece part, yet in very close quarters. A solid combination nest and backup plate could not be mounted here because of limited space. It was necessary, therefore, to make the nest integral with the die block. Maintenance costs are higher for this construction, because the die maker consumes more time to avoid grinding away the side location surface when sharpening the die blocks. In addition, the die has keyed sections and a solid yoke all around it. Both punch and die sections are mounted on a die set that has the leaderpins on the centerline instead of the back, thus assuring rigidity where it is most needed.

Cheap Shaving Dies

We have also built cheap shaving dies that fulfill their purpose. Of these, Fig. 5 is typical. Here we used a ¾-in.-thick-die block, spring pad, location pins, a commercial die set, and a heeled punch to prevent deflection. Dies like this can be made within 30 hr, whereas others made of high-speed or high-chrome, high-carbon steels take five to ten times as long.

When shaving a few thousandths of material, there are times when it is difficult to obtain a "bite" into the metal. If the punch or die is slightly dull, or the spring pressure is not great enough on the spring pad, there is a tendency for the piece part to move from the nesting points. This is true when the shaving area is fairly large compared to the periphery of the piece part or the backup edge. To prevent possibility of such movement, many parts are designed with a tab opposite the shaved edge. See Fig. 6. This tab is trimmed away at the same time shaving is done.

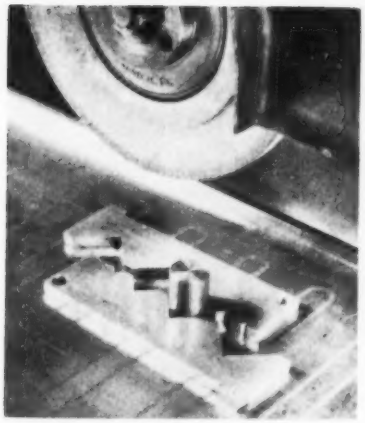
Common Features

Shaving dies of cheap construction of the very best quality have one common feature—namely, exceptionally close clearance between punch and die, and very small "angular" clearance in the die block. In our experience for materials up to 0.090 in. thick, the clearance should not exceed 0.0005 in. The closer the die maker can come to a slip fit, the more accurate will be the part dimensions. Obviously, precision-fitting dies like these should be adequately lubricated when they are in operation.

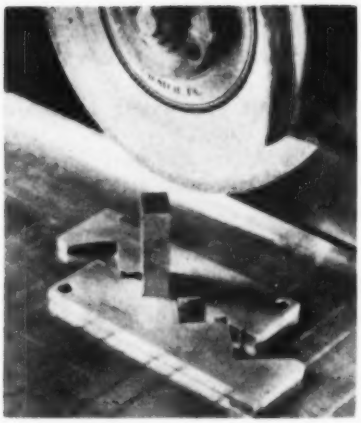
Because the punch and die members are so closely matched to assure close-tolerance piece parts, the die block is made with little or no angular clearance. For example, in a blanking die we normally use 5 to 8% angular clearance per side. However, in a shaving die we do not have a true slug. Emphasis is placed on accuracy. Therefore, angular clearance is not required. Hence, a shaving die that removes material to very accurate dimensions, say within 0.001 to 0.002, should not have an allowable back taper to exceed 50% of this amount.

In conclusion, always watch out for the burr side on the piece part. After the blanking or notching operation (in a progressive die where a shaving station is incorporated), any burrs that remain on the parts or areas not shaved must be on the proper side. Where shaving is done in a secondary operation be sure that the burr side is up. This will help in two ways: (1) the shaving punch will "bite" into the material (Fig. 7), and (2) the piece part will locate properly and be level.

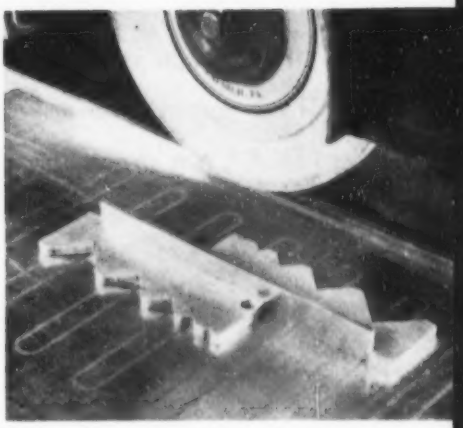
"I don't see why you can't do your overtime work down at the plant like other men!"



ROUND AND RECTANGULAR parts too small for successful holding on the average magnetic chuck of a surface grinder can be supported adequately with these backup plates for normal grinding



RELATIVELY LONG PIECES can be set on end between the backup plates and ground without danger of movement. Plates 0.055, 0.240 and 0.365 in. thick have been made for different applications



FOR HOLDING LONG narrow pieces on edge, backup plates are reversed, as shown. Steps at each end of the plates provide adequate end stops for edge grinding relatively thin parts

Notched plates boost holding power of magnetic chucks

Here's an easy way to hold small parts safely on a magnetic chuck for surface grinding

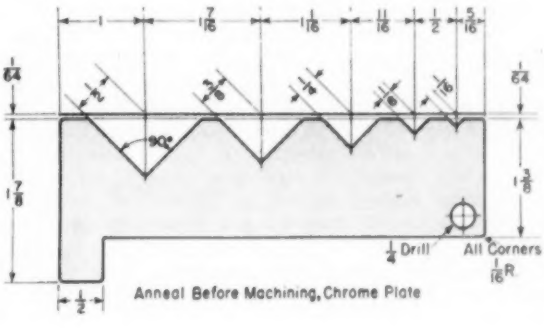
BY ROBERT DOUBLE, Manufacturing Engineer, Manufacturing Engineering Laboratory, WESTINGHOUSE ELECTRIC CORP

Thin magnetic-iron plates, notched as shown, have proven advantageous for holding small parts on the magnetic chucks of toolroom and production surface grinders in several Westinghouse plants. Notches of several sizes are provided, so parts of different sizes can be supported adequately under grinding thrusts. Plates also have been used successfully for holding small non-magnetic parts—when the parts are first placed on cutouts of thin, double-faced, adhesive tape.

Round and rectangular parts can be supported adequately with these backup plates, as shown. In addition, many irregularly shaped parts can be surface ground more accurately when thus supported. The plates are 5 in. long, which is ample to insure their extending over several magnet cores and so increase their holding power.

Generally used in pairs, each plate has a ¼-in. hole in one corner for hanging on a hook on the column of the grinder when not in use.

Cost of the plates is extremely small and they can be made up in batches of a dozen or more at a time in any toolroom.



FIVE NOTCHES of different sizes are provided along one side of each plate so adequate support can be provided when grinding parts of different cross-section size. Chrome plating minimizes wear

- *HOW can you eliminate confusion and conflict in your plant?*
- *WHAT can you do to develop better teamwork?*
- *IS it fair to blame your foremen for your troubles?*
- *HERE'S a short, fast-reading article packed with pointers that will help you answer these questions and learn . . . . . .*

HOW GOOD IS YOUR ORGANIZATION?

BY GEORGE S ODIORNE, Management Training Staff, RUTGERS UNIVERSITY

It's not easy to recognize that poor organization may be at the root of all the conflict and confusion in your company. This is especially true in the small company where the structure seems so clear-cut and simple. When things get "balled up," the tendency is to blame it on people. "If we could only straighten out that troublemaker, Jones, everything would be OK around here." It's true, of course, that human relations are extremely important. However, when there's conflict and confusion, there's a fifty-fifty chance that kinks in the organization chart are to blame for your troubles.

Do You Keep Your Supervisors Informed?

Take the case of the little tool company where the general foreman pushed his men like a slave-driver to get a job out, only to have it sit around the shipping floor for three months. It is easy to imagine what the boys thought about further pleas to put out "just a little more" because some job was "hot."

Actually the customer had cancelled his order, but the word hadn't drifted through the sales department in time to do any good. This is what the management experts call poor communications, but it grew mostly out of the fact that the organization wasn't set up to permit messages to flow smoothly through the channels down to the boys in the shop.

A railroad doesn't run without tracks, and information doesn't flow over the kinks in your organization structure. Unless you install plumbing, you don't get running water; and unless you establish organizational channels, you don't get communication of ideas, company policies, company progress and plans, financial status, customer information, personnel policies, expected changes in employment, promotional changes, and advantages of working for the company, to list only a few.

What are a few of the channels you should install? They ought to include periodic meetings, letters, bulletin boards, company papers, personal conferences, or training programs. When you try to get along without them, the grapevine fills the gap, and not always to the company's advantage.

Do Your Policies Encourage Teamwork?

While we are looking at the organization setup, let's check to see if it provides unity. This means "one-ness" in the organization, with the whole company working as a team, from the President down to the sweeper. Studies of firms which have unity of organization show four basic traits common to all:

1. We can define every employee's responsibility. This means that every employee knows just where he stands in the company: who his bosses are, who his equals are, and who stands in a lesser position. He knows his next step up the ladder and his place in the company's plans.

2. Every employee has an opportunity to express himself. It may be in the form of verbal expression about his job, or in assignments that tax his ability. He must have some outlet for his imagination.

3. There are uniform, consistent rules for all. This means that equal jobs are paid equally, promotion is for readily understood reasons, and benefits are impartially given.

4. The employee feels that he is part of the team. Each person in the organization knows what his part of the job is, and what his status and function are.

Are You Using Effective Training Methods?

Still another source of conflict and confusion in any company is a failure to train people in an orderly, systematic manner. This aims at increasing the ability of the employee to function effectively in his niche in the organization picture, or to move on to the next higher spot. Most good training programs have four distinct steps:

1. Make a training timetable: This is simply setting down how much skill you expect the person to have, and when you hope to have him reach this stage. It may be teaching a man to grease a truck in one day, or it could be a program of making a clerk into chief accountant in ten years.

2. Select the method of training: This may be the understudy method, an apprentice program, lectures, film forums, or sending people to school.

3. Select the trainers: All supervisors are partly in this category. Furthermore, certain teaching tasks should be entrusted to specialists, either from within the company or from outside.

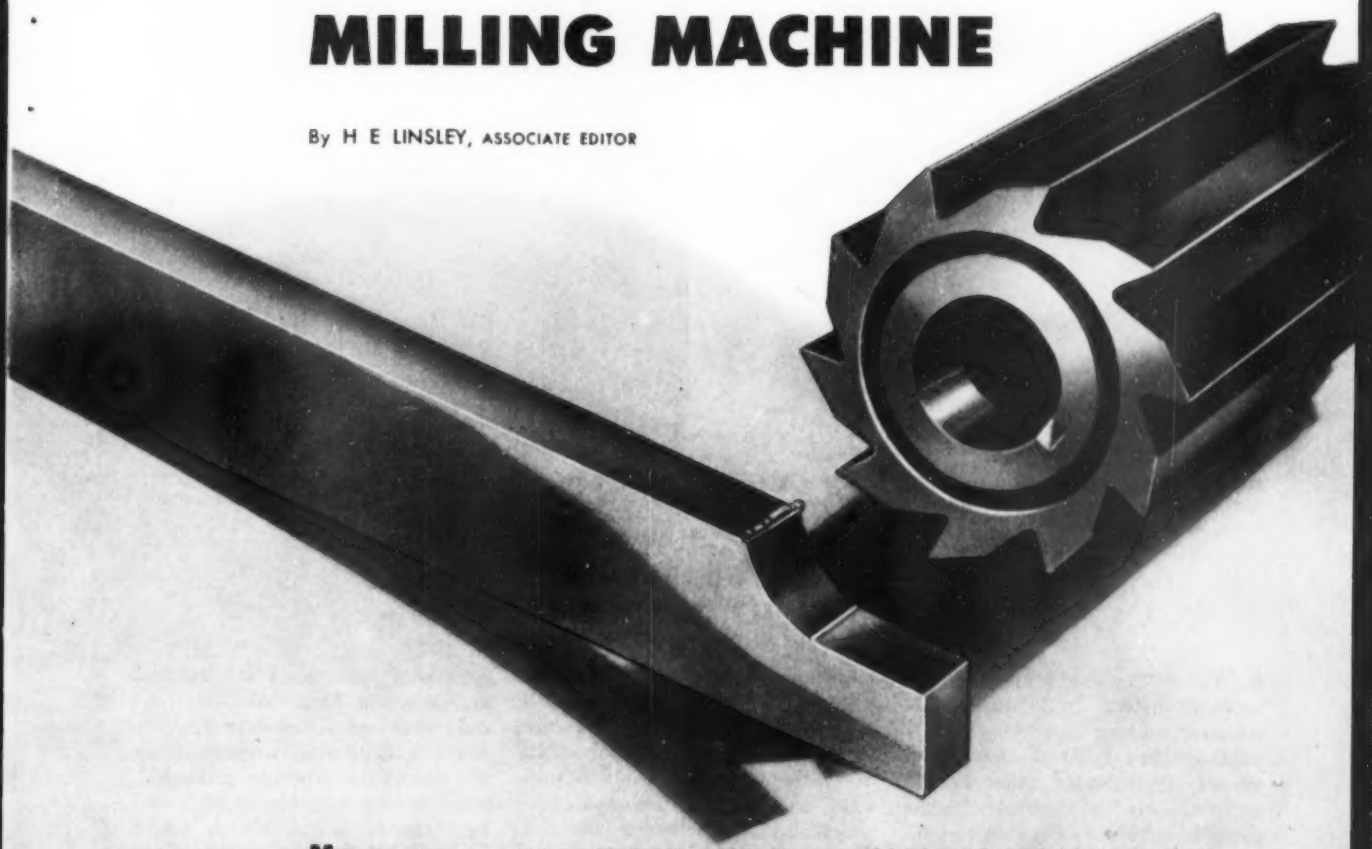
4. Follow-through: Keep records and progress reports to check actual learning against the timetable. Always be on the lookout for new means of training.

If conflict and confusion are every day commodities in your company, look first to the organization chart. Bring about unity of organization, start a smooth flow of communication, then lubricate with good training; and it will be surprising how many of the so-called "human-relations" problems will disappear.

how to run a

MILLING MACHINE

By H E LINSLEY, ASSOCIATE EDITOR



Milling machines share with lathes the distinction of being the most useful and versatile machines in the shop. As the lathe is to the production of cylindrical surfaces, so is the milling machine to the production of flat surfaces — although both are capable of performing other operations.

In milling, the cutter rotates, usually at a fairly high speed, and the work is fed past it. The position of the spindle and cutter remains fixed, and the table, carrying the work, moves right and left, up and down, or in and out.

Milling machines may be divided into two main categories; the knee and column type, and the manufacturing, or bed, type. The latter is designed for quantity production of identical parts and is usually automatic or semiautomatic in operation. Its successful performance does not depend on the skill of the worker, and it is usually tended by a semiskilled "operator," rathan than by a skilled machinist. For this reason, the operation of manufacturing-type machines will not be discussed in detail.

There are also many special types, such as automatic knee and column and fixed bed machines, planer millers, automatic rise and fall millers, tracer-controlled machines, and horizontal boring, drilling, and milling machines, but these require individual training and are outside the scope of this report.

The machinist who has mastered the basic principles of operating a standard machine will have no difficulty in handling any of the other types. It is not the purpose here, to attempt to impart all the necessary information — that can be obtained only by actual experience — but rather to supply background information for the benefit of the newcomer to industrial life, so he may understand something of the machines and tools he will use, how they should be handled, and what he can do with them.

This Special Report is another AMERICAN MACHINIST service to production executives. It is intended to help train apprentices and new employees in the fundamentals of milling machine operation.

American Machinist SPECIAL REPORT NO. 329 TO THE METALWORKING INDUSTRIES

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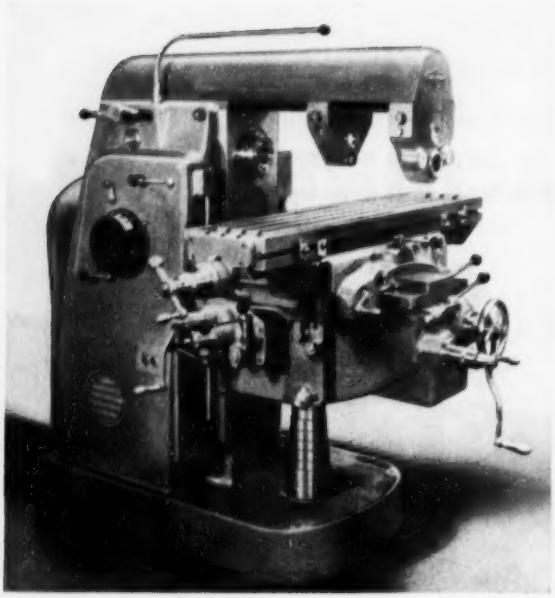
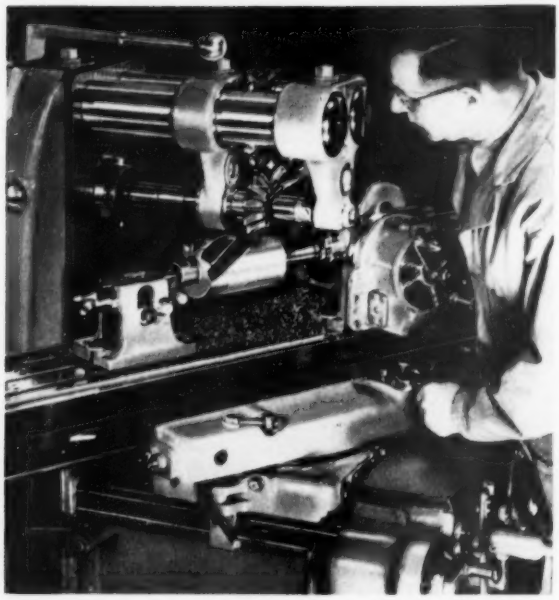


PLAIN, HORIZONTAL knee-and-column milling machine is the type most commonly found in metalworking plants. Its rigidity and accuracy make it suitable for most milling jobs



UNIVERSAL MILL is similar in most respects to the plain type, but has the added advantage that the table can be swiveled horizontally to facilitate making angular cuts

MILLING MACHINES

By far the most common type is what is known as the knee-and-column milling machine. It is available in a variety of sizes and speeds, and ranges from simple hand millers to extremely large, complex machines capable of performing a great variety of operations by the aid of various attachments and fixtures. If the spindle is horizontal, the machine is known as a horizontal miller; if vertical, it is known as a vertical miller. Table movements may be controlled manually or by power.

The machine consists, essentially, of a rigid, box-type column which houses the main spindle and much of the gearing and speed-changing mechanism. The front face is accurately machined for supporting and guiding a knee-shaped projection which supports the saddle and worktable. The base of the column projects forward to provide a support for the knee-elevating screw, and also to act as a reservoir for the cutting fluid.

The knee can be moved up and down the face of the column to provide vertical feed; the saddle, mounted on top of the knee, gives movement of the table to and from the column face; and the table is mounted on the saddle to permit longitudinal feed across the face of the column. The table is provided with T-slots, running lengthways, for alignment purposes.

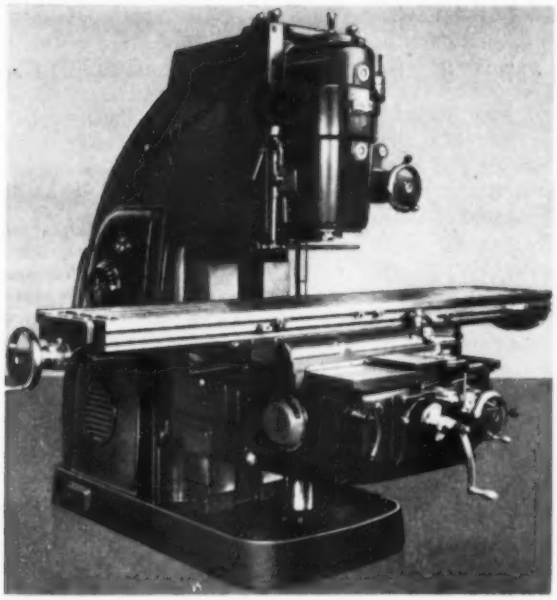
If, in addition to these movements, the table is mounted on a housing to permit its being swiveled on the saddle in a horizontal plane, the machine is known as a universal type.

On a horizontal machine, the spindle projects from the front of the column and is driven by suitable gearing mounted inside the column. The outer end—the spindle nose—has a tapered hole and driving keys for locating and driving the cutters. The cutters may be mounted on an arbor, an adapter, or directly on the spindle nose, depending on the type of cutter. To furnish additional support and to insure exact alignment of the cutter arbor, an overarm is mounted and guided on top of the column. Depending on the make of the machine, this may be a single or double bar, or a solid ram mounted on dovetail ways. Either type may be moved in and out and clamped firmly in place. At the outer end of the overarm is a bracket containing a bearing for the end of the arbor or, if desired, a center can be mounted for guiding special arbors. For added rigidity when taking extremely heavy cuts, braces are provided for attaching the end of the overarm to the knee.

VERTICAL MILL

On vertical machines, the spindel is located vertically, parallel to the column face, and is mounted in a sliding head that can be fed up and down by hand or power. Some machines are designed so the entire head can also be swiveled to permit working on angular surfaces. These machines do not have overarms or braces, but are otherwise similar in operation to horizontal machines.

Most knee-and-column machines have both hand and power operation of the three slides so, by moving the table, saddle, and knee, respectively, the table can be positioned and the work fed to the cutter. Either hand or power op-



VERTICAL MILL follows the same basic design as the plain horizontal machine, but has the spindle in a vertical position. Its primary purpose is the milling of large flat surfaces

RAM-TYPE MILLING MACHINE carries the spindle and drive motor on a separate, movable ram on top of the main column. Movable cutter head can be turned for either horizontal or vertical machining

eration may be used in setting up and preliminary adjustments, but power is employed almost exclusively in the working cycle, which can be controlled by suitable trip dogs. Rapid traverse is commonly provided. This is a method for moving the work rapidly into cutting position.

RAM-TYPE MILL

A variant of the knee-and-column machine is the ram-type. On this, a movable ram—looking somewhat like a conventional overarm—carries a cutter head on one side, and a separate spindle drive motor. The cutter head can be swiveled to any angle from horizontal to vertical, and the machine can thus perform horizontal or vertical milling. Movement of the ram is not a feed, but is for setup purposes and makes possible operations that would be otherwise difficult or impossible to perform on conventional machines.

MANUFACTURING-TYPE MACHINES

Manufacturing-type milling machines are used primarily for quantity production and have a fixed table support, or bed, with the table at a convenient working height. Only longitudinal movement is provided for the table, but the spindle is mounted in a special, box-like carrier which can be adjusted vertically on the headstock, or upright. Crosswise adjustment of the spindle is provided by the quill in which it is mounted. These movements are for setting up only —they are not intended as feed movements.

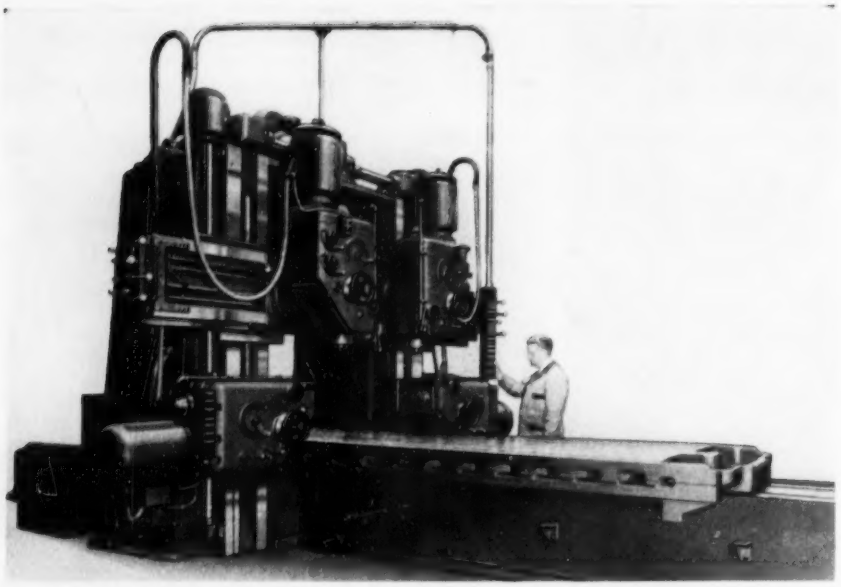
Standard machines are made in two types: plain machines with one horizontal spindle, and duplex machines with two horizontal spindles located on opposite sides of the table. In general, these machines are either partly or fully automatic and feature automatic cycle of rapid approach of work to cutter, and rapid movement during the nonworking part of the cycle of cutter and table, with selective, automatic spindle stop. After the machine is set up, the operator is required only to load and unload the work and to start the automatic cycle. This is controlled by preset dogs on the front of the table sequentially operating a plunger which controls the rate of table movement.

Sometimes, these machine are equipped with a reciprocating table cycle to permit feeding and rapid traversing in both directions. This permits two fixtures to be used—one on each end of the table—so work can be machined in one while the other is being unloaded and loaded.

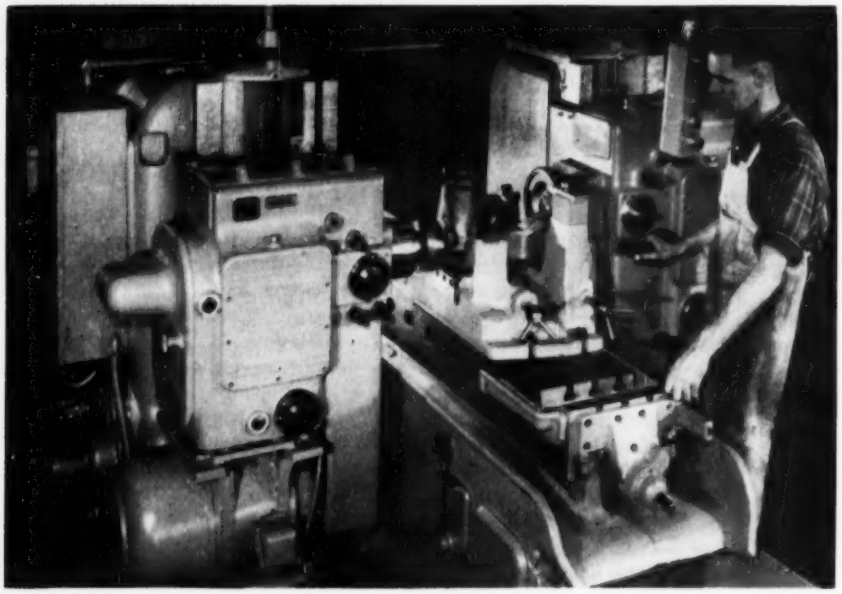
OTHER TYPES

In addition to the basic types described above, there are several other kinds of milling machines used for specific jobs. One of the more common is the hand miller used for relatively light work on small parts. On this type, all table movements are hand operated, usually by levers. In one type, vertical feed is obtained by raising or lowering the table; in an other, by raising or lowering the spindle. Hand levers give quick and sensitive feed, and either horizontal or vertical movement can be locked securely while the other is used.

Stops can be set to limit table



PLANER-TYPE MILLING MACHINE has four adjustable and individually controlled spindles and is employed for heavy stock removal on large parts. Four surfaces can be machined simultaneously



DUPLEX MANUFACTURING MILL is designed for large-quantity production of identical parts. Cutter heads are adjustable for height, but table has only back and forth movement

travel and make possible cuts of exact length or depth.

Bench millers are, in effect, miniature editions of standard machines and are particularly well suited for small parts manufacture. Despite their small size, they are built to the highest standards of accuracy and are in common use in the watch and precision-instrument industries.

Automatic knee-and-column machines are manufacturing types similar in appearance to standard knee-and-column machines. Their operation is similar to that of the plain manufacturing machine in that table longitudinal feed is the only power-operated feed. Knee and spindle can be adjusted for setup but, during the operating cycle, the table longitudinal traverse is operated by power and controlled automatically by trip dogs.

Automatic fixed-bed machines feature completely automatic table cycles controlled by dogs and a cycle selector, and automatic starting and stopping of the spindle at any predetermined point in the feeding cycle. They may incorporate automatic rise and fall of the spindle carrier synchronized with table traverse for milling surfaces located in different planes or between end obstructions.

Unit-type, automatic fixed-bed machines consist of several small manufacturing millers mounted on

a common base. They can be used for progressive milling operations with a minimum of lost time for transferring work from one machine to another.

Automatic rise and fall machines are employed for operations on medium-size work, such as milling keyways and surfaces between end projections which do not permit the table to traverse directly into the cut. They may also be used for straightforward operations.

Tracer-controlled machines are employed for production of curved or irregular surfaces, and may be operated by a tracer riding on a cam, or through servomotors and hydraulic circuits for three-dimensional forms.

Planer mills resemble regular planers but are equipped with milling heads mounted on the cross-rail and at the sides. They are commonly employed for making multiple cuts on large or extremely long work.

MACHINE CONTROLS

Most milling machines have mechanically operated feeds, although hydraulic operation has been incorporated in some models. The particular advantage of hydraulics is that it permits infinitely variable feed rates and shockless operation. The location and exact operation of the controls varies with each make of machine, but the accompanying illustration shows a typical arrangement. Details for each particular machine should be obtained from the operator's manual supplied with the machine. In general, the spindle speed is selected from the left side of the column, other controls, from the front of the knee. However, many machines have duplicate controls at front and rear for greater operator convenience. All table movements can be performed by hand with suitable cranks or handwheels having micrometer dials, and clamps are provided to lock the table in any position. By engaging appropriate levers, power feed or rapid traverse can be applied to any table movement. Should the operator forget to loosen the clamps before engaging the feed, a safety clutch will slip to protect the machine. Feed rates are selected by a dial, usually at the front of the machine.

On one type of machine, both feed and speed dials are on the column, and rate changes are effected by power. Moving one lever in one direction causes the speed dial to rotate, with a momentary stop at each numeral. When the level is released the proper gears are in mesh for the speed indicated by the arrow. Moving the lever in the other direction performs the same function for the feed rate.

Movement of control levers has been standardized on most machines to avoid confusion when changing from one make to another. Turning the table handwheel to the right, or engaging the longitudinal power feed lever to the right will cause the table to move to the right; reversing the procedure will cause it to move to the left. Turning the saddle cross feed handwheel or moving the power feed lever to the right will cause the saddle to travel in toward the column; turning the handwheel or moving the power feed lever to the left will cause the saddle to move out. Turning the knee elevating crank to the right or pulling the power feed lever up will cause the knee to move up; turning the crank to the left or pushing down on the power feed lever will cause the knee to move down. On vertical machines with sliding heads, the knee and table controls are the same, but a separate control is provided for the head. Moving the handwheel to the right or pulling the power feed lever down will move the head down; similarly, movement of the handwheel or lever in the opposite direction will raise the head.

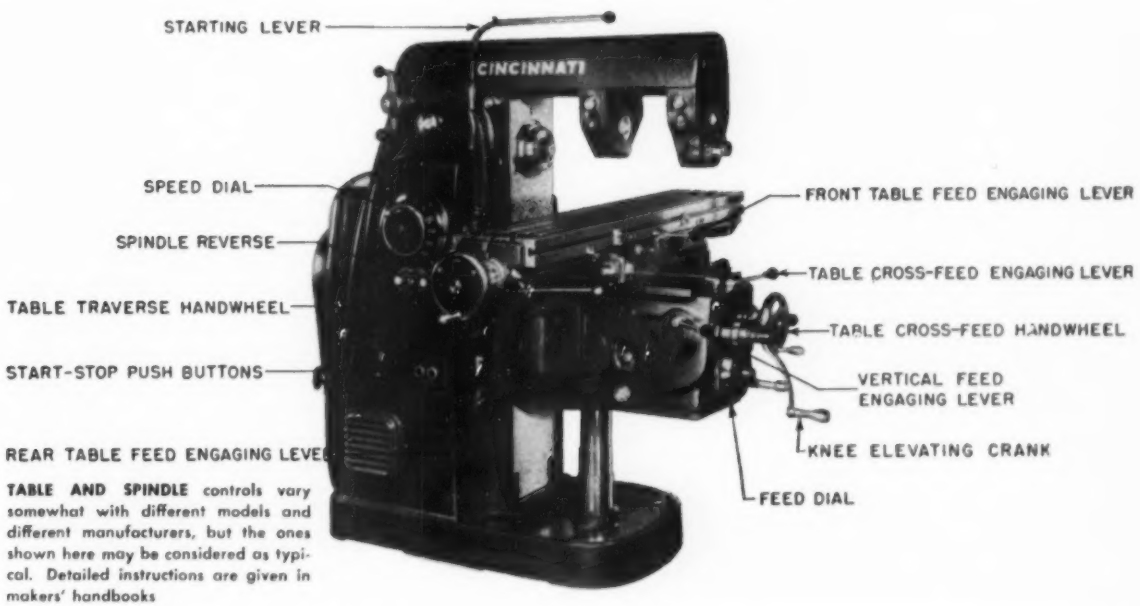
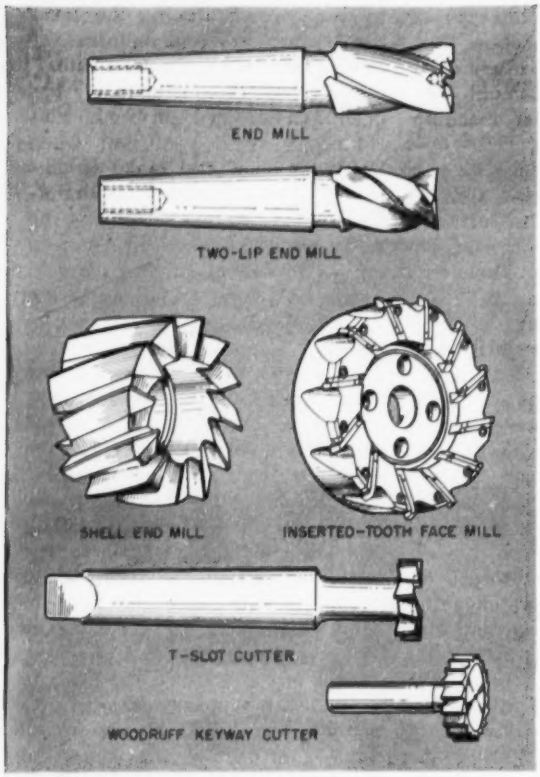


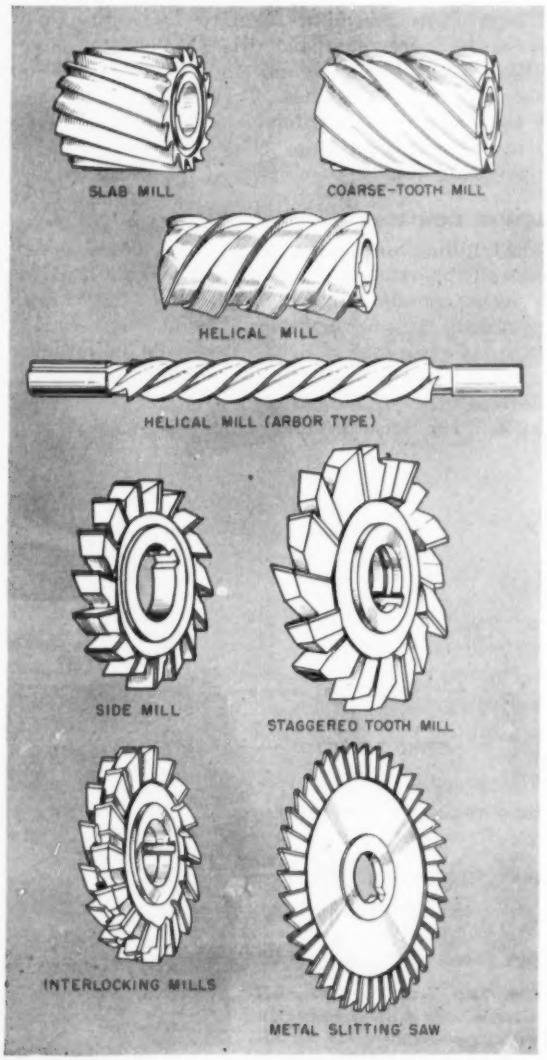
TABLE AND SPINDLE controls vary somewhat with different models and different manufacturers, but the ones shown here may be considered as typical. Detailed instructions are given in makers' handbooks

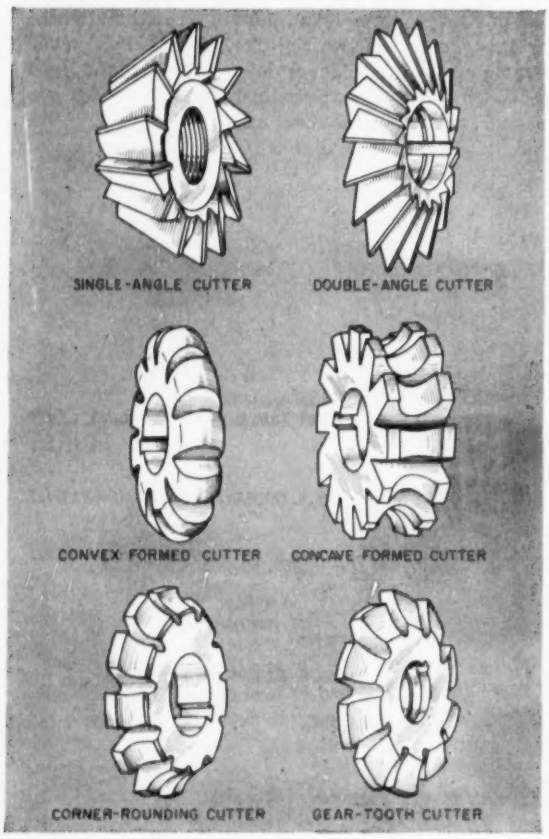
MILLING CUTTERS



END AND FACE MILLING cutters may be used on either horizontal or vertical machines. T-slot and keyseat cutters are special-purpose tools

PERIPHERAL MILLING CUTTERS commonly employed for machining flat surfaces, sawing, and grooving





FORM CUTTERS shown here are standard and available from stock, but special forms can be made to suit any particular profile required

Milling cutters consist generally of a cylindrical body with teeth on the periphery. They may be of the solid type with body and teeth integral, or inserted-tooth type with individual, removable teeth attached to the body by suitable means. The teeth may be straight —parallel to the axis—or arranged in a helix. The body may have a central hole for mounting on an arbor, a recessed back for mounting directly on the spindle nose, or be made integral with a shank for insertion in the spindle end. Cutters may be made for right- or left-hand rotation, and with either right- or left-hand helix.

The hand of a cutter can be determined by looking at the front end when mounted on the spindle. A right-hand cutter must rotate counterclockwise; a left-hand cutter rotates clockwise. A right-hand helix is shown by the flutes leading to the right; a left-hand helix by flutes leading to the left. The direction of the helix does not affect the cutting ability of the cutter, but take care to see that the direction of rotation is correct for the hand of the cutter.

Plain milling cutters are cylindrical cutters with teeth on the periphery only, and are used for producing flat surfaces. They are available in a wide variety of widths and diameters, and have an accurately ground bore for mounting on an arbor. Light-duty cutters, less than ¾ in. wide, normally have the teeth parallel to the axis (straight teeth); those of greater width usually have the teeth arranged on approximately a 25° helix. Heavy-duty plain cutters are made in larger widths only, and the teeth have a helix angle between 25 and 45°. They are designed for heavy stock removal and have fewer teeth than a light-duty cutter of equal dia. This gives greater tooth strength and more chip clearance. Wide cutters are commonly known as slab mills. The term "spiral mill" is often used to describe cutters with helical teeth, but this is incorrect and should not be used.

Helical mills are similar to plain mills, but the teeth have a helix angle of between 45 and 60°. The steep helix produces a shearing action that results in a smooth, vibrationless cut. They are available for arbor mounting, or with an integral shank with or without a pilot. This type is particularly useful for milling elongated slots and for light cuts on soft metals.

Side milling cutters have teeth on the periphery and both sides, and are intended primarily for shallow slotting operations. For deep slotting, staggered-tooth side mills are preferred. These are made so alternate teeth cut opposite sides of the slot. This provides ample chip clearance and free cutting. Both types are limited to fairly narrow widths and have the disadvantage that the width is reduced slightly at each sharpening, thus altering the width of the slot cut.

Interlocking cutters consist of two cutters similar to side mills, but made as a unit with interlocking teeth. This permits adjustment to different widths by inserting shims between the two parts and makes it possible to compensate for the changed dimensions resulting from wear and sharpening. Their chief purpose is slotting to accurate width, but if the slots are narrow, and the cutters consequently thin, there may be a tendency for the cutters to close in, resulting in a change in the slot width.

Half side milling cutters have teeth on the periphery and one side only, and serve for face milling where only one side of the cutter is required. They are frequently used in pairs—one RH and one LH spaced apart on the arbor—for milling two surfaces simultaneously, in which case they are commonly referred to as straddle mills.

Metal slitting saws are thin, plain milling cutters with the sides slightly dished to prevent rubbing. They are intended for cutting-off operations and for milling deep, narrow slots, and are normally made in widths from 1/32 to 3/16 in. Thinner types with parallel sides are also available—down to a few thousandths thick. These are sometimes known as slotting saws and are used for such work as slotting screw heads.

For heavy sawing, saws are made with staggered teeth, and may also have side teeth similar to side mills. Such types are usually made from 3/16 to 3/8 in. wide.

End milling cutters have straight or helical teeth on the circumference and straight teeth on one end, and serve for milling slots, and facing or profiling narrow surfaces. They are made with integral shanks, either straight or tapered, except shell end mills, which are described below.

Two-lip end mills, also known as slotting mills, have only two teeth on the circumference, and the end teeth are cut to the center. They can be sunk into the work like a drill, then fed lengthwise to form a slot.

Shell end mills are made in larger sizes than plain end mills and are recessed on the face to receive a screw or nut for mounting on a separate shank or stub arbor driven by keys on the spindle nose. The teeth are usually helical, and the tool is used particularly for face milling operations requiring the facing of two surfaces at right angles to each other.

Angle milling cutters are shaped like a truncated cone and are used for such operations as cutting dovetails, V-notches, and serrations. The single-angle type has teeth on the conical surface and, usually, on the larger face. Standard angles are 45 and 60°, although other angles can be obtained. In specifying angle cutters, note particularly that the angle referred to is always the included angle between the conical face and the larger flat face.

Double-angle cutters have V-shaped teeth and are, essentially, two single-angle cutters with the smaller faces facing outward. The angles on the conical faces are not necessarily the same and, in such cases, each angle must be specified as the angle between the conical face and a plane through the intersection of the two cones. If the angles are the same, the included angle between the conical faces must be given.

Face mills are almost always made with separate teeth inserted and held in a body by any of several different locking methods. They are usually made in sizes

over 6 in. in dia, and serve for machining side surfaces of large work or, in vertical machines, for the top surface.

Woodruff keyway cutters are small, plain mills with integral shanks made specifically for cutting seats for Woodruff keys. They are produced in sizes to suit the various standard sizes of keys, and are intended to be sunk straight into the work; they are not suitable for traversing.

T-slot cutters are similar to keyway cutters, but are made with staggered teeth and side cutting faces specifically for forming T-slots after a straight slot has been cut in the work with a side mill to permit the cutter shank to enter.

FORM CUTTERS

Form cutters are made specially to cut profiles. They include convex and concave curves, gear-tooth forms, spline, thread, and corner-rounding cutters, as well as a great variety of simple and complicated shapes. They are made in two general types—profile cutters, and form-relieved cutters. The former are sharpened by grinding the OD in such a manner as to produce a small land immediately behind the cutting edge. This means that each sharpening will reduce the diameter somewhat and must be done in such a manner as to follow exactly the original profile. With a suitable profile-grinding machine, this is not difficult on simple forms but almost impossible on complicated shapes.

Form-relieved cutters are made with an eccentric relief and are designed to be sharpened on the cutting face only. No matter how often the cutter is sharpened, it will retain its original shape throughout its entire life, although the OD will be slightly reduced. Such cutters are somewhat more costly to produce, but their long life compensates for this and they are usually preferred for cutting curves and other profiles.

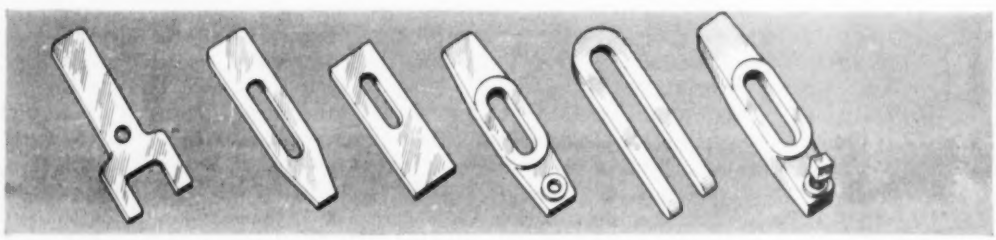
HOW TO SET UP THE WORK

Several factors govern the method of holding the work on the machine table, including the type of machine; nature of the cut, roughing or finishing; direction of cut; type of cutter; shape and rigidity of the work; and quantity of pieces to be produced.

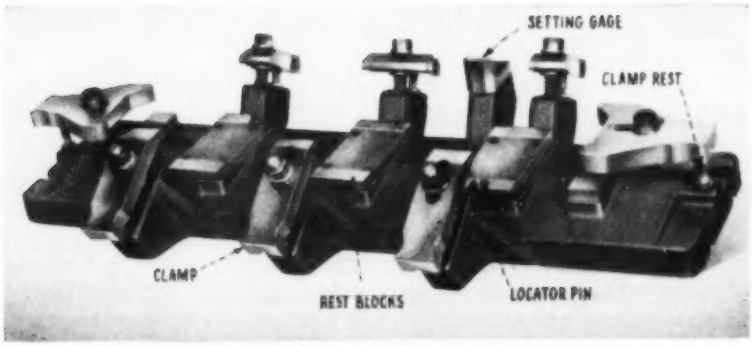
The first step in making any setup is to make sure that everything is clean. Wipe off the table surface, and clean out all chips from the T-slots. Wipe the hole in the spindle with a dry rag, and see that it is free from burrs and foreign matter. Do not oil the hole. Make sure the table ways are free of gummy oil, and lubricate them if necessary. If the overarm is to be used, see that it moves freely and that the bearing hole in the arbor support is clean and oiled. Check that the entire machine is in good running order and properly lubricated, and that the table moves freely, but not too freely, in all directions. Despite common practice, do not blow dirt and chips off the machine with an air hose. Use a rag or brush. Blown chips can be forced into the small clearances between working surfaces and can score them badly. Also, they may travel a considerable distance and cause serious eye injuries to yourself or other employees.

Where quantities are large, and particularly on production-type machines, special fixtures are usually provided for holding the work, although some jobs, such as large castings, are often clamped directly to the table. Details of fixture design need not concern the operator, but there are certain points which are of interest to him, and which are common to all types. A means is provided for aligning the fixture with the machine table; this usually consists of two keys, or tongues, machined for a close fit in the T-slots. Holes or slots are provided for anchoring the fixture to the table. In addition, there are one or more locating points on which the work must rest. These may be hardened and ground buttons, pads, or locating pins, depending on the particular workpiece. And finally, there is some provision for clamping the work quickly and securely in the fixture.

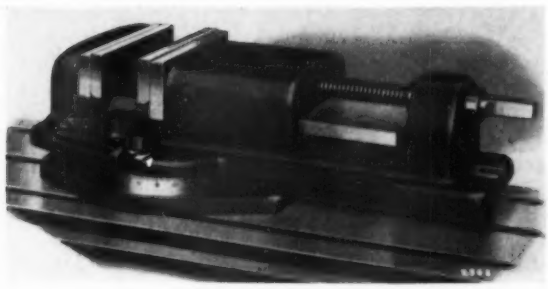
In many cases, cutter-setting gages are incorporated to facilitate the setup. A feeler of specified thickness is placed on the gage surface, and the table adjusted until the feeler can just be pulled out between the cutter and the gage.

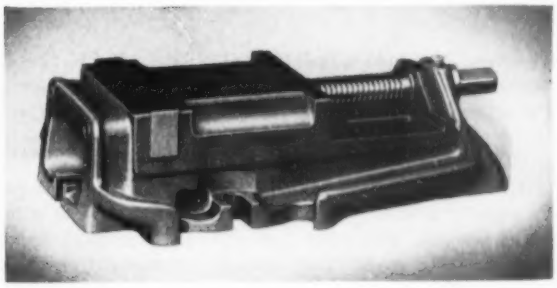


TYPES OF CLAMPS, step blocks, and jacks commonly employed in making setups. Note position of clamp and bolt in correct setup



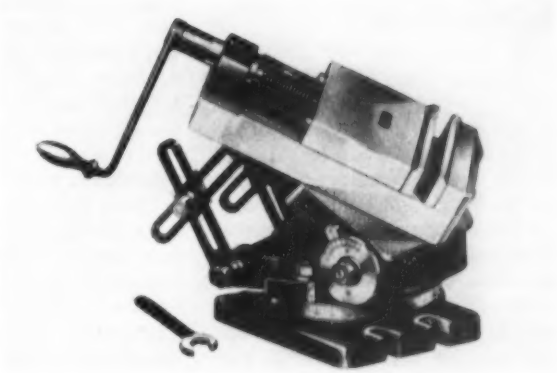
ESSENTIAL ELEMENTS of a manually clamped fixture include clamps, clamp rests, locators and, sometimes, a cutter-setting gage





SWIVEL VISE has a base attached to the machine table and graduated in degrees. Vise body can be swiveled to any required angle

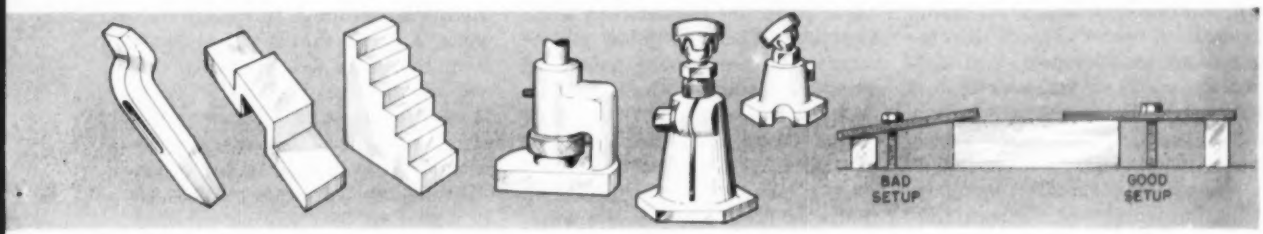
PLAIN VISE (above right) is mounted directly on the table and is lower than the swivel type

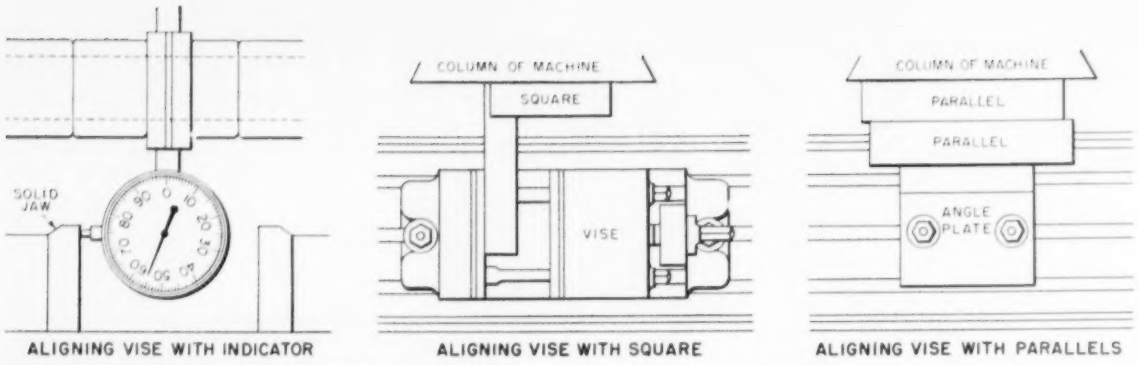


TOOLMAKER'S UNIVERSAL VISE is a useful accessory particularly suited for toolroom work. The body can be adjusted in two planes

This insures the correct depth of cut without time-consuming cut-and-try work.

Fixtures may be designed to hold several pieces for simultaneous machining, or may be of the indexing type so one piece is being machined while another is being loaded. Cylindrical work may be mounted between centers in a rotary indexing fixture. Other features found on fixtures may include equalizers, to distribute the clamping pressure on irregular surfaces; spring-loaded support pins, to be locked in place after clamping and prevent deflection of the work under the cut; and quick-acting clamps, either mechanical, pneumatic, or hydraulic. When clamps are to be tightened with a wrench, avoid excessive pressure. Clamps must be tightened sufficiently to hold the work securely, but not so severely as to distort it. Clean the fixture base before installing it on the machine,





ALIGNING VISE WITH INDICATOR — ALIGNING VISE WITH SQUARE — ALIGNING VISE WITH PARALLELS

ALIGNMENT of the vise jaws with the columns or spindle can be done in several ways. The indicator method is the more accurate

and clean all work-support points after every cut. Remember that even a tiny chip can throw the fixture or work out of line and cause inaccurate work.

Magnetic chucks are also used to a considerable extent in milling machine work, and offer the advantage of extremely fast loading and unloading.

TOOLROOM MILLING

For single-piece or small-lot production, when it would be impracticable to make special fixtures, the work must be held by an individual setup. Considerable ingenuity may be required to position the work and hold it securely, and to arrange the clamps so they will not be struck by the cutter, or foul parts of the machine.

The simplest holding arrangement is the milling machine vise. This usually has a special base to be bolted to the table, and a swiveling body to permit adjustment to any angle in a horizontal plane. The base carries a scale graduated in degrees. This is sufficiently accurate for most work, but if exact angles are required, the setting must be checked with a protractor. If swiveling is not required, plain vises are available, or some types can be removed from the base and bolted directly to the table. Specially shaped jaws are sometimes made for holding irregular work. For work involving compound angles, the toolmaker's universal vise is extremely convenient. It is designed to permit adjustment in both the horizontal and vertical planes.

Air- or cam-operated vises are sometimes employed, but the standard vise is opened and closed by a crank or cam and lever. Many authorities strongly disapprove of hammering the handle of a vise to obtain a sure grip, on the grounds that it may crack or break the screw or other parts and lead to a serious accident when cutting pressure is applied. On the other hand, many practical machinists insist on the practice, maintaining that it is imperative to grip the work securely. If this is done, use a lead or babbitt hammer to strike a single sharp blow after tightening as much as possible by hand. Don't pound the handle with a machinist's hammer.

Clean the base of the vise carefully before installing it on the machine, then check that it is accurately aligned. The most accurate way is with a dial indicator. Clamp the indicator on the machine arbor, then move the table so the indicator tip rests on the fixed, not the adjustable, jaw. Set the dial to zero and, using the manual feed, traverse the jaw past the indicator. Adjust the vise, as needed, until the indicator shows no variation between the two ends of the jaws.

Another method is to place the stock of a machinist's square against the face of the machine column and bring the blade into contact with the fixed jaw with tissue paper feelers between blade and jaw. When an equal pull is required to remove the feelers all along the blade, the vise is aligned.

Grip small work near the center of the jaws, not at one end, and use parallels when necessary to raise it above the top surface of the jaws. If several pieces are being held, tighten the vise just enough to hold them, then tap them down firmly with a lead hammer to make sure they are firmly seated before final tightening. This is good practice, even with a single piece.

HOLDING WITH CLAMPS

For work which cannot be held in the vise, an individual setup must be made, and it is here that the skill and ingenuity of the operator is most clearly revealed. The ideal is a job so securely held that it cannot shift under the heaviest cutting load, yet is not distorted by the clamping pressure. It must be adequately supported so it does not deflect under the cut, yet require a minimum of time and trouble for the setup. And all this without the clamps interfering with the sweep of the cutter over the work.

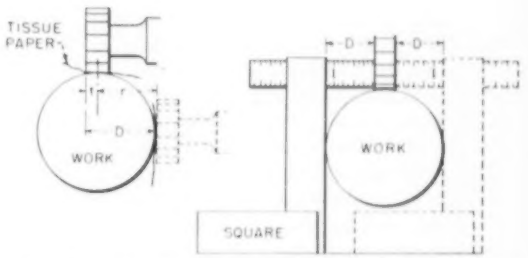
Most work can be held directly on the table with simple clamps, as shown in an accompanying illustration, although V-blocks are usually required for round work. Angle plates, or elbows, are another extremely useful accessory for making table setups. Avoid clamping on overhung surfaces or frail sections, and use screw jacks to support the underside of such areas. Place packing pieces under the tail of the clamps so the tail is as high as, or slightly higher than, the clamping surface of the work. A clamp that is tipped away from the work will probably slip and will require excessive pressure for tightening. Always arrange the clamp so the bolt is nearer to the work than to the clamp heel.

U-shaped clamps are particularly useful, as they can be adjusted

or removed without removing the hold-down nut; bent or gooseneck clamps make possible low setups which provide more clearance for the operator and the cutters. Pin clamps have a projecting pin to fit into a suitable hole in the work. Standard T-bolts are commonly used for holding the clamps. They fit closely in the T-slots of the table and are held with nuts and washers. In some cases, spherical-seated nuts and washers may be used to advantage. A useful accessory is a step block to support the clamp heel at various heights. The block is easily made and saves the time and trouble of searching for suitable packing pieces.

In most milling operations, the action of the cutter tends to move the work along the table and, except on light cuts, it is advisable to place a stop block or pin at one end to resist this action. If clamps must bear on a finished work surface, place a thin brass shim between clamp and work. If a rough, unfinished surface must rest on the machine table, protect it with brass or thin cardboard. The latter is quite common but take care that it does not squeeze down enough to loosen the work or change the depth of cut.

Whether work is held in a fixture, a vise, or directly on the table, always locate it as close to the column as possible; the less overhang the cutter has, the more accurate will be the work. But be sure the work or holding device will not strike any part of the machine as it traverses past the cutter.



LOCATION OF THE CUTTER in relation to the center of round workpiece can be established by either of these methods

HOW TO SET UP THE CUTTER

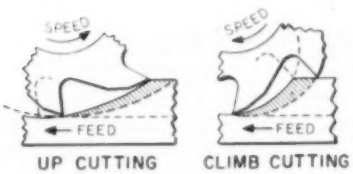
Handle cutters with care! They are expensive tools and can be ruined by dropping on the floor or machine table. And even one chipped tooth can cause enough chatter and vibration to spoil an expensive workpiece. Also, the edges are extremely sharp and can cause painful cuts if carelessly handled.

The first thing to decide is the type of cutter to be used, such as slab mill, face mill, side mill, or other type, and this will be governed chiefly by the conditions of the job. If several surfaces are involved, consider the possibility of ganging several cutters to machine as many surfaces as possible simultaneously. Use half side mills in preference to full side mills if only a single side is to cut.

Next, consider the matter of size. Remember, the smaller the cutter the less it costs, but it is often necessary to use a larger cutter to obtain the desired surface speed. If possible, have the cutter large enough to span the entire work surface so the job can be done with a single pass. If this cannot be done, pick a cutter that will do the work with the smallest number of passes, but always allow for a considerable overlap of the cuts.

Direction of rotation must now be considered. Many cutters can be reversed on the arbor, so be sure you know whether the spindle is to rotate clockwise or counterclockwise. Direction of feed is important in this connection. In conventional milling, the direction of feed is opposite to the direction of rotation. This is often called "up-cutting" and means that the cutting edge of the tool starts at the bottom of the cut and takes off a progressively thicker chip as feed progresses. In the old days, all milling was done this way, but there is a disadvantage in that there is always a certain amount of rubbing before the tooth takes hold, and the finished surface shows a series of small scallops.

Faster cutting rates and a better finish are usually obtained when the feed is in the same direction as the cutter rotation. This is known as "climb milling" or "down milling" and has the added advantage that the pressure of the cut tends to hold the work down on the table. However, it cannot be employed on older machines unless they have been specially modified by incorporating a backlash eliminator on the feedscrew nut. An



DIRECTION OF CUTTER rotation in relation to direction of feed is highly important. Climb cutting is usually faster and gives better finish if suitable machine is available

exception to this is in the case of light cuts where finish is unimportant and the work must be climb milled—as in some end milling operations. Most modern machines are designed for climb milling, but make sure of this before attempting the operation. Climb milling on an unsuitable machine will result in the work being dragged under the cutter. The cutter will then jam and break, and the machine may be seriously damaged.

MOUNTING THE ARBOR

To mount the arbor, first wipe the spindle hole and the arbor shank clean and dry, and make sure there are no burrs. If there are, stone them off with a fine oilstone—not a file. Loosen the retaining nut, and insert the shank into the hole with the slots engaging the keys on the spindle nose. Insert the drawbolt and pull the arbor snugly into place.

To mount the cutter, remove the nut and as many spacers as necessary, and slide the cutter carefully onto the arbor. It will be a close fit and should be pushed on evenly and squarely. Select a key somewhat longer than the width of the cutter and slide it into the keyway. If the spacers do not have keyways, the key should be slightly shorter than the cutter width. Add sufficient spacers to fill up the remaining space on the arbor, and install the nut finger tight only. Do not tighten it with a wrench. Locate the cutter as close to the column as possible.

Adjust the overarm so the end of the arbor engages in the bearing in the support bracket. The bracket should be as close to the cutter as possible and still clear the work. Lock the overarm clamps. Check that the cutter bears against the drive side of the key by turning it backward. There should be no play if the proper size of key has been used, but it is better to check. Then tighten up the arbor nut with a suitable wrench. If extra rigidity is required, install the overarm braces.

Face mills, end mills, and similar cutters having integral shanks are mounted directly on the spindle nose or in suitable adapters, and do not require use of the overarm. Single-angle cutters are often made for use on a threaded shank and may be operated with the large flat facing either front or rear. Take care in mounting these that the cutting action will tend to screw them tighter on the shank—not unscrew them. Use a right- or left-hand threaded cutter and shank, as may be needed.

ARBORS, ADAPTERS, and collets are made in a wide range of types and sizes for mounting various kinds of cutters

LOCATING THE CUTTER

For many operations, the position of the cutter in relation to the work is of no great importance. Usually, the worktable is moved up or down, forward or back, until the cutter just touches the work. If the cutter must be accurately positioned in relation to some other flat surface, a square or straightedge can be used to align the cutter with this surface, then the work moved the necessary amount by the manual controls. However, if a round surface is involved, as in milling a keyway in a shaft, a different technique is required.

If the work is such that the front side of the cutter can be brought tangent to it, move the table by hand until a tissue paper feeler can just be pulled out between the work and the cutter. Set the cross-feed dial to zero. Then lower the table and move the work toward the cutter a distance equal to one-half the dia of the work, plus one-half of the thickness of the cutter. This can be measured exactly by counting the number of graduations on the dial. If extreme accuracy is required, measure the paper thickness and allow for it. If the cutter cannot be brought tangent to the work, a square and scale may be employed, as shown, but this is much less accurate. To set for depth of cut, raise the table until a paper feeler can just be pulled out between the cutter and the top of the work, and set vertical-feed dial to zero.

FEEDS AND SPEEDS

Selection of the correct feeds and speeds for milling is largely a matter of individual experience and judgement and, although tables of suggested rates are given below, it must be remembered that these are suggestions only. When starting a new job, and until sufficient practical experience has been gained, always start with the lower figure given for the particular material. Then increase until chatter or excessive cutter wear indicates practicable limit has been passed.

Many variables govern the selection of the feed and speed rates. These include: material to be machined, type of cutter used, width and depth of cut, surface finish required, rigidity of machine and setup, type of cutting fluid and method of application, and power and speed available.

Speeds are always quoted in surface feet per min (sfpm), that is, the speed at which the circumference of the cutter passes over the work. Thus, the surface speed of an 8-in. cutter will be twice as great as a 4-in. cutter for a given number of revolutions of the spindle. The spindle speed of a milling machine, however, can be given only in revolutions per min (rpm), so it is necessary to translate sfpm into rpm when making speed adjustments on the machine.

An accompanying table gives the rpm for cutters of different diameters at various surface speeds. Other speeds can be found by simple calculation—for example, for 400 sfpm, a given cutter must run four times as fast as for 100 sfpm.

If a table of speeds is not available, the spindle speed can be calculated by the formula:

$$rpm = \frac{sfpm \times 12}{\pi \times dia}$$

Note that the table of cutting speeds is based on average conditions, and is for high speed steel tools. For carbide-tipped tools, the speeds may be doubled or, in the unlikely event that carbon-steel cutters are employed, the speeds should be halved.

Cutters with helical teeth can usually run faster than those with straight teeth because the shearing action allows them to cut more freely. Similarly, coarse-tooth cutters can operate faster than fine-tooth cutters because there are fewer teeth in contact with the work at any time. Heavy cuts must be run slower than light ones, and deep slots slower than shallow ones. Usually, roughing cuts are made at slow speeds and heavy feeds, and finishing cuts at high speeds and fine feeds. There are, however, exceptions to this.

FEED RATES

The rate at which the work advances past the cutter is known as the feed rate and is commonly quoted in inches per min (ipm). There can be no fixed rules for determining feed rates because so many variables are involved. The general rule for production work is to use all the feed the machine and work will stand; the problem is to know where to start. The accompanying tables, however, will be found suitable for average work. Note that these tables are given in thousandths of an inch per tooth for various cutters. To determine the feed rate in ipm, multiply feed per tooth by number of teeth, and the product by the rpm.

In practice, it is better to start somewhat lower than the figures in the tables, and to work up to or beyond them until the most efficient metal removal rates are reached. Excessive cutter wear indicates too high a feed, but it is a known fact that more cutters are spoiled by too fine a feed than by too heavy a feed. Fine feeds

REVOLUTIONS PER MINUTE

Dia.	Surface Feet Per Minute						
	40	50	60	70	80	90	100
1/16	611	764	917	1070	1222	1375	1528
5/64	489	611	733	8566	978	1100	1222
3/32	407	509	611	713	815	917	1019
7/64	349	437	524	611	698	786	873
1/8	306	382	458	535	611	688	764
9/64	244	306	367	428	489	550	611
5/32	204	255	306	357	407	458	509
11/64	175	218	262	306	349	393	437
1"	153	191	229	267	306	344	382
1-3/16	136	170	204	238	272	306	340
1-1/4	122	153	183	214	244	275	306
1-5/16	111	139	167	194	222	250	278
1-3/8	102	127	153	178	204	229	255
1-7/16	94	117	141	165	188	212	235
1-1/2	87	109	131	153	175	196	218
1-5/8	81	102	122	143	163	183	204
2"	76	95	115	134	153	172	191
2-1/4	68	85	102	119	136	153	170
2-1/2	61	76	92	107	122	137	152
2-3/4	52	69	83	97	111	125	139
3"	51	64	76	89	102	115	127
3-1/4	44	55	65	76	87	98	108
4"	38	48	57	67	76	86	95
4-1/2	34	42	51	59	68	77	85
5"	31	38	46	54	61	69	76
5-1/2	28	35	42	49	56	63	70
6"	25	32	38	45	51	57	64
7"	22	27	33	38	44	49	55
8"	19	24	29	33	38	43	48
9"	17	21	25	30	34	38	42
10"	15	19	23	27	31	34	38
11"	14	17	21	24	28	31	35
12"	13	16	19	22	25	29	32
13"	12	15	18	21	24	27	29
16"	10	12	14	17	19	22	24
18"	8	11	13	15	17	19	21

TABLE OF CUTTING SPEEDS
(Surface Feet Per Minute)

MATERIAL	HIGH SPEED STEEL		CARBIDE-TIPPED		COOLANT
	Rough	Finish	Rough	Finish	
Cast Iron	50-60	80-110	180-200	350-400	Dry
Semi-steel	40-50	65-90	140-160	250-300	Dry
Malleable Iron	80-100	110-130	250-300	400-500	Soluble, sulfurized or Mineral Oil
Cast Steel	45-60	70-90	150-180	200-250	Soluble, Sulfurized, Mineral or Mineral Lard Oil
Copper	100-150	150-200	600	1000	Soluble, Sulfurized or Mineral Lard Oil
Brass	200-300	200-300	600-1000	600-1000	Dry
Bronze	100-150	150-180	600	1000	Soluble, Sulfurized or Mineral Lard Oil
Aluminum	400	700	800	1000	Soluble or Sulfurized Oil, Mineral Oil and Kerosene
Magnesium	600-800	1000-1500	1000-1500	1000-5000	Dry, Kerosene, Mineral Lard Oil
SAE Steels					
1020 (coarse feed)	60-80	60-80	300	300	Soluble, Sulfurized, Mineral or Mineral Lard Oil
1020 (fine feed)	100-120	100-120	450	450	" " "
1035	75-90	90-120	250	250	" " "
X-1315	175-200	175-200	400-500	400-500	" " "
1050	60-80	100	200	200	" " "
2315	90-110	90-110	300	300	" " "
3150	50-60	70-90	200	200	" " "
4340	40-50	60-70	200	200	Sulfurized and Mineral Oils
Stainless Steel	100-120	100-120	240-300	240-300	" " "

Note: Feeds should be as much as the work and equipment will stand, provided a satisfactory surface finish is obtained.

Suggested Feed Per Tooth for *High Speed Steel* Milling Cutters

Material	Face Mills	Helical Mills	Slotting and Side Mills	End Mills	Form Relieved Cutters	Circular Saws
Plastics	.013	.010	.008	.007	.004	.003
Magnesium and Alloys	.022	.018	.013	.011	.007	.005
Aluminum and Alloys	.022	.018	.013	.011	.007	.005
Free Cutting Brasses and Bronzes	.022	.018	.013	.011	.007	.005
Medium Brasses and Bronzes	.014	.011	.008	.007	.004	.003
Hard Brasses and Bronzes	.009	.007	.006	.005	.003	.002
Copper	.012	.010	.007	.006	.004	.003
Cast Iron, Soft (150-180 B.H.)	.016	.013	.009	.008	.005	.004
Cast Iron, Medium (180-220 B.H.)	.013	.010	.007	.007	.004	.003
Cast Iron, Hard (220-300 B.H.)	.011	.008	.006	.006	.003	.003
Malleable Iron	.012	.010	.007	.006	.004	.003
Cast Steel	.012	.010	.007	.006	.004	.003
Low Carbon Steel, Free Machining	.012	.010	.007	.006	.004	.003
Low Carbon Steel	.010	.008	.006	.005	.003	.003
Medium Carbon Steel	.010	.008	.006	.005	.003	.003
Alloy Steel, Annealed (180-220 B.H.)	.008	.007	.005	.004	.003	.002
Alloy Steel, Tough (220-300 B.H.)	.006	.005	.004	.003	.002	.002
Alloy Steel, Hard (300-400 B.H.)	.004	.003	.003	.002	.002	.001
Stainless Steels, Free Machining	.010	.008	.006	.005	.003	.002
Stainless Steels	.006	.005	.004	.003	.002	.002
Monel Metals	.008	.007	.005	.004	.003	.002

Suggested Feed Per Tooth for *Sintered Carbide* Tipped Cutters

Material	Face Mills	Helical Mills	Slotting and Side Mills	End Mills	Form Relieved Cutters	Circular Saws
Plastics	.015	.012	.009	.007	.005	.004
Magnesium and Alloys	.020	.016	.012	.010	.006	.005
Aluminum and Alloys	.020	.016	.012	.010	.006	.005
Free Cutting Brasses and Bronzes	.020	.016	.012	.010	.006	.005
Medium Brasses and Bronzes	.012	.010	.007	.006	.004	.003
Hard Brasses and Bronzes	.010	.008	.006	.005	.003	.003
Copper	.012	.009	.007	.006	.004	.003
Cast Iron, Soft (150-180 B.H.)	.020	.016	.012	.010	.006	.005
Cast Iron, Medium (180-220 B.H.)	.016	.013	.010	.008	.005	.004
Cast Iron, Hard (220-300 B.H.)	.012	.010	.007	.006	.004	.003
Malleable Iron	.014	.011	.008	.007	.004	.004
Cast Steel	.014	.011	.008	.007	.005	.004
Low Carbon Steel, Free Machining	.016	.013	.009	.008	.005	.004
Low Carbon Steel	.014	.011	.008	.007	.004	.004
Medium Carbon Steel	.014	.011	.008	.007	.004	.004
Alloy Steel, Annealed (180-220 B.H.)	.014	.011	.008	.007	.004	.004
Alloy Steel, Tough (220-300 B.H.)	.012	.010	.007	.006	.004	.003
Alloy Steel, Hard (300-400 B.H.)	.010	.008	.006	.005	.003	.003
Stainless Steels, Free Machining	.014	.011	.008	.007	.004	.004
Stainless Steels	.010	.008	.006	.005	.003	.003
Monel Metals	.010	.008	.006	.005	.003	.003

Courtesy, Cincinnati Milling Machine Co

tend to produce rubbing, rather than cutting, and dull the cutting edge. Excessive heat may also be generated. The same applies to the depth of cut. Always try to get well below the surface skin with the first cut on castings and rough forgings. And try to avoid cuts less than 0.015 in. deep. When a good finish is required, take a roughing cut, followed by a finishing cut, and use a higher speed and lighter feed for finishing.

Remember that the above data on feeds and speeds are for average conditions. Reduce speed for hard and abrasive materials, sandy castings or scaly forgings, and for extremely heavy cuts. Reduce speed also for high-manganese or high-nickel steels, and heavy work and rigid setups. Increase speed for light cuts, frail work or setups, or soft material. Increase speeds also for small-dia cutters, for improved surface finish, or if cutter edges start to chip.

As speeds are reduced, increase the feed. Therefore, increase feed on abrasive, sandy, or scaly material, and for heavy cuts in heavy work with rigid setups. Increase feed if cutter wear is excessive or if there is chatter. Soft materials and light slabbing cuts also usually require a feed increase.

Decrease feed for better finish, when taking deep slotting cuts, when cutters are frail, or if work cannot be held rigidly. Also decrease if cutter starts to chip, or produces long, continuous chips.

TAKING THE CUT

Before starting to actually cut metal, make a quick check that everything is in order. See that the work and fixture will clear all parts of the machine, and that the cutter will not strike any part of the fixture or holding device. Make sure the machine is well oiled and that there is plenty of cutting fluid in the reservoir. Lock all table movements that will not be required, and see that those to be used are unlocked. Set the table dogs to throw off the feed after the required length of cut. If rapid traverse is to be used, set the necessary dogs to stop rapid traverse before the work reaches the cutter. Check that the starting lever and table control levers are all in neutral. See that the spindle speed control has been set to the required speed, then reduce the feed rate to about one-half or one-quarter of what you have selected for cutting.

Start the main motor and cutting fluid pump, and push over the starting lever. Watch that the cutter is turning in the right direction. If not, stop the spindle, engage the reverse lever, and restart the spindle. Position the work to take a light trial cut before going to full depth. Push the table control lever in the direction you want the table to move, and take the trial cut—about ½ in. long. Stop the machine, reverse the table, and examine the cut. If it appears satisfactory, and the work is still firmly held, increase the feed rate to the full estimated amount and take a full-depth cut over the entire work surface. Make sure that there is plenty of cutting fluid pouring over the work at the point where the cutter engages. Don't direct the stream at the cutter itself, or the fluid will fly all over the place and will not reach the spot where it is most needed. Unless for some very good reason, do not stop the cutter until it has passed right over the work, or there will be a depression, or scallop, left on the surface. This is particularly important on finishing cuts.

Do not reverse the work back under the cutter without first backing it away slightly. To do so will cause chatter, and may even cause a jam that will break the cutter and spoil the work. Remember that all feedscrews have a certain amount of backlash, so a slight backward movement on the handle will not move the table the same amount. Note the starting point, then give the handle a half-turn or more. When you move the handle forward again to the starting point, the work will be back to exactly the same place. Then you can advance it the needed amount for the next cut.

CUTTING FLUIDS

Cutting fluids are essential for most milling operations, except on cast iron and brass. Either soluble oil or straight oil may be used according to the material being machined. Suggested fluids for various materials are given in the table of cutting speeds, but these may be varied according to the job or the practice in a particular plant.

Keep an ample flow of fluid running on the work; don't dribble it or you will do more harm than good, but don't use so much that it runs over on the floor.

Cast iron should always be milled dry because the dust forms a pasty mass when wet and will clog up table drains, collect on feed screws and generally make a mess of the machine. Furthermore, it is highly abrasive and can do serious harm to bearing surfaces. Dry, it can be brushed away without trouble.

Magnesium is usually milled dry, although kerosene or, sometimes, oil may be used on difficult jobs. Magnesium chips catch fire easily and burn furiously if water is present. When handling this material, keep the table swept off, and put the chips in a metal container with a cover. Don't let them collect on the floor or on your clothing, as you may be badly burned if a fire should start. Don't play with chips.

ATTACHMENTS AND ACCESSORIES

Although the standard milling machine is highly versatile, its over-all usefulness can be vastly improved by the addition of a wide variety of standard accessories and attachments.

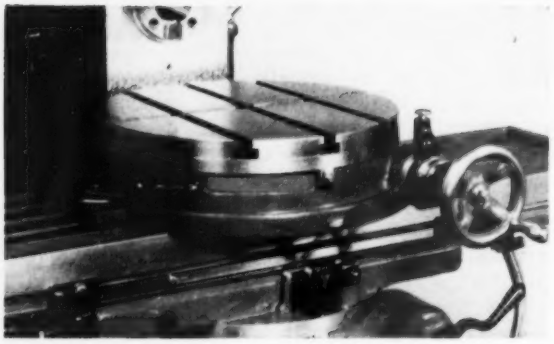
Perhaps the most common of these is the universal dividing head. This provides a means of holding the work in a chuck, between centers, or in a collet, and turning it around (indexing) through almost any desired number of equal divisions. The unit is mounted on the machine table and the head can be tilted to any angle from below horizontal to well past vertical. The spindle, on which the work is mounted, can be rotated through a full 360° by a worm or bevel gears.

A crank is provided for turning, and a series of index plates is available for dividing the circle into any desired number of parts. For example, to divide into seven parts, select a circle of holes on the index plate which is divisible by seven, say 28. As 40 revolutions of the crank make one revolution of the spindle, divide 40 by the number of divisions to give 5 5/7. Then to obtain seven equal divisions it will be necessary to turn the crank five whole turns and 5/7 turn for each division. As there are 28 holes in the circle, take 5/7 of 28, or 20. So, after each cut, turn the crank 5 turns, plus 20 spaces on the 28-hole circle.

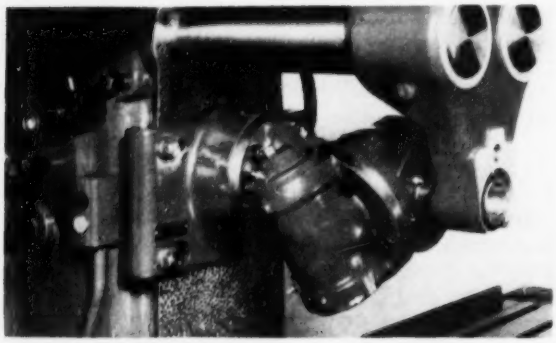
Several types of dividing head are available, together with special attachments for dividing as high as 400,000 divisions, for dividing directly by degrees, minutes, and seconds, and for rotating the spindle continuously in fixed ratio to table longitudinal movement for milling a helix. Tailstocks and steadyrests are also available for use with the head.

Similar to the universal dividing head is the plain indexing head. This permits dividing the circle in-

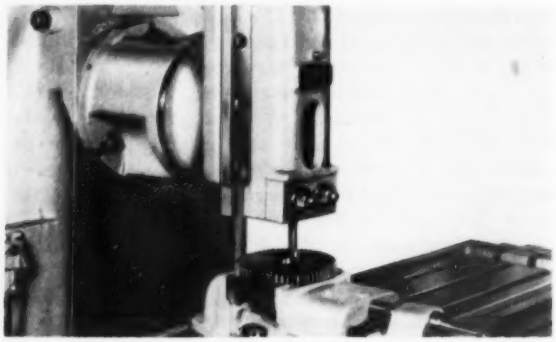
UNIVERSAL DIVIDING HEAD with tailstock and steadyrest. Permits indexing through any desired number of divisions



ROTARY TABLE allows work to be turned by hand or continuously by power. Indexing mechanism can be attached for accurate dividing



UNIVERSAL MILLING ATTACHMENT converts horizontal into vertical machine and can be swiveled in two directions for angular cuts



SLOTTING ATTACHMENT changes rotary into reciprocating motion for slotting keyways and similar work. Attachment can be turned through any angle from vertical to horizontal

to many different divisions, but does not have the wide range of the universal head and cannot be tilted. Variations of this include the gear-cutting attachment for cutting gears, and the spiral milling head with a driving mechanism for coupling to the table feedscrew.

The rotary table is almost indispensable for toolroom work, as it adds a fourth feed motion to the regular feeds. It consists of a base, clamped to the machine table, and a rotary table which may be turned either by hand or by a power feed operated from the longitudinal feedscrew. The table is graduated in degrees, the crank dial in minutes. For accurately spacing a number of holes or machined surfaces, an indexing unit can be mounted in place of the plain crank. This operates in the same manner as the index on a dividing head.

Vertical milling attachments are designed to permit vertical milling on a horizontal machine. Of the various types, some are clamped to the column and overarm and are driven by the main spindle at either a 1 to 1 or 2 to 1 ratio; others are driven at high speed for die sinking and similar work where small cutters are employed. Some have a limited amount of swivel, others swivel to any angle parallel to the column face, and still others are universal in that they swivel in two directions. A different type is mounted on the overarm only and has its own high-speed motor, making it independent of the main spindle drive. For ease in handling these rather heavy units, a crane is sometimes provided on the machine, and a special storage bracket mounted on the side.

For cutting slots and keyways, a slotting attachment may be attached to convert the rotary motion of the spindle into reciprocating motion. The unit can be swiveled through 360° so slots can be cut horizontally or vertically.

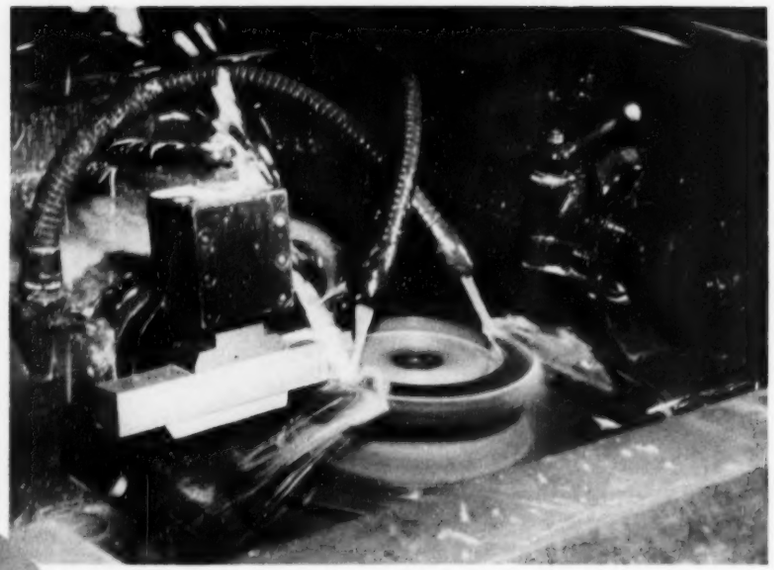
For milling rack teeth, a special attachment changes the direction of motion of the spindle so it runs parallel to the length of the table. Cutting is done by using the cross feed, and special indexing equipment is employed to move the table in increments corresponding to the the linear pitch of the rack.

Other special equipment includes keyway milling attachments, double-spindle vertical milling attachments, chucks and raising blocks for index and dividing heads, quick-change adapters for mounting drills, end mills, and similar small tools in the machine spindle, and precision measuring equipment for exact setting of head or table positions to within 0.0001 in.

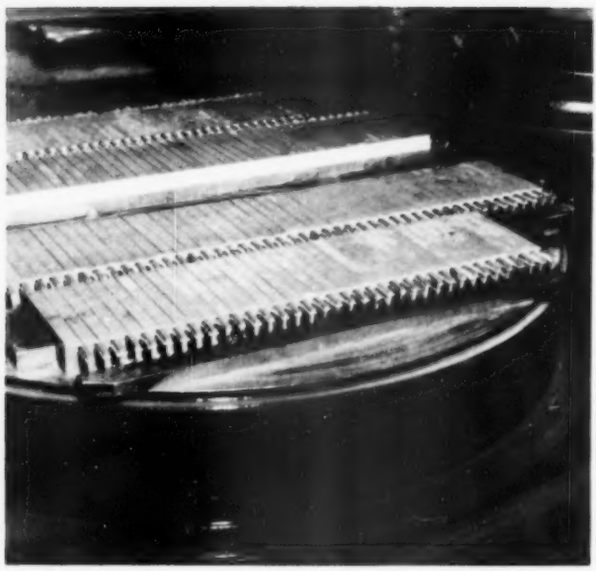
A number of special attachments can also be supplied by the machine builders to suit particular conditions.

WE ACKNOWLEDGE . . .

with sincere gratitude the generosity of the several manufacturers of milling machines who have contributed so liberally in furnishing the text, illustrations, and friendly criticism which have made this report possible.



Repeated tests have proved satisfactory cutting action cannot be obtained when using silicon-carbide wheels on Ex-Cell-O automatic grinders for high-volume sharpening of carbide-tipped single-point tools. Only diamond wheels have been applied successfully to date. Proper coolant applied in large volume also is essential



Surface grinding of large table-loads of carbide tools can be done successfully only with diamond wheels, and only when work is flooded with proper coolant. Here carbide tips of 170 tools are being finished simultaneously with an 18-in.-OD, 1-in.-face, 100-grit, 100%-concentration, resinoid-bond, diamond cup wheel on a Blanchard grinder

By F J LENNON, Jr, General Superintendent
KENNAMETAL INC

Economic Factors Must Govern Wheel Sele

Data recently released by NPA and attributed to grinding-wheel manufacturers has indicated that in the event of critical shortages of industrial diamonds, grinding of cemented carbides can be accomplished satisfactorily with silicon-carbide abrasives. But such a reversal of practice would seriously affect the metalworking industry, and should be given careful consideration.

It is true that *most* necessary grinding operations on carbide tools can be performed with silicon-carbide wheels – such wheels were used for these operations for a number of years before diamond grinding wheels became available some 20 years ago, and in most plants rough grinding of carbide tools still is done with silicon-carbide wheels.

But fine finishing of carbide surfaces and cutting edges with silicon-carbide wheels is difficult, and requires considerably more time and skill than is needed when diamond wheels are used. Generally it takes two to three times as long to finish-grind a carbide single-point tool or milling cutter with a silicon-carbide wheel. So twice as many finish-grinding machines would be necessary for the same level of production – and in time of emergency, grinding machines probably will be as difficult to obtain as diamonds.

Furthermore, tests have proved it is impractical to perform precision surface, cylindrical and internal grinding operations on carbide parts except with diamond wheels. And grinding of ledge-type chip breakers on carbide tools with silicon-carbide wheels borders on the impossible.

Some time ago, tests were conducted at the Kennametal plant to determine the practicability of diamond wheels on a No. 2 Cincinnati centerless grinder for finishing solid carbide cylinders. Prior to these tests, 20-in.-OD, 6-in.-face silicon-carbide wheels were employed, and it was virtually impossible to hold tolerances closer than 0.001 in.

Over a four-months period, one 16-in.-OD, 2-in.-face, D100-N50-BR-⅛ diamond grinding wheel costing (at that time) $1,136.25 outlasted eight silicon-carbide wheels that would have cost $545.76, and tolerances of 0.0005 in. could be held easily. Tolerances as close as 0.0003 in. can be held when required.

Accurate records were kept of production during the test runs. The eight silicon-carbide wheels ground a total of 16,023 pieces, while the one diamond wheel ground 36,976 pieces (2.3 times as many) in the same time. Thus a production gain of 130% was made possible by the diamond wheel. Furthermore, wheel cost per piece ground was less.

Use of diamond wheels for this centerless-grinding operation has eliminated frequent wheel dressings and the constant checking of part diameters formerly necessary because of rapid breakdown of the silicon-carbide wheels, has made possible greater stock removal per pass, and has permitted speeding up the regulating wheel to reduce time per pass. Formerly scrap was high, because it was difficult for the operator to hold size; today there is virtually no scrap loss from this operation.

Should it be necessary at any time to revert to silicon-carbide wheels, two additional centerless grinders would be necessary to maintain the production rate.

Another example is that of finishing flat ends of some 1½-in.-dia solid carbide rounds. These

Carbide tools can, in most instances, be ground with silicon-carbide abrasives . . . But grinding rate is slower, quality of surface finish generally is reduced materially, and costs are higher. And, for some jobs, diamond wheels are essential

be done
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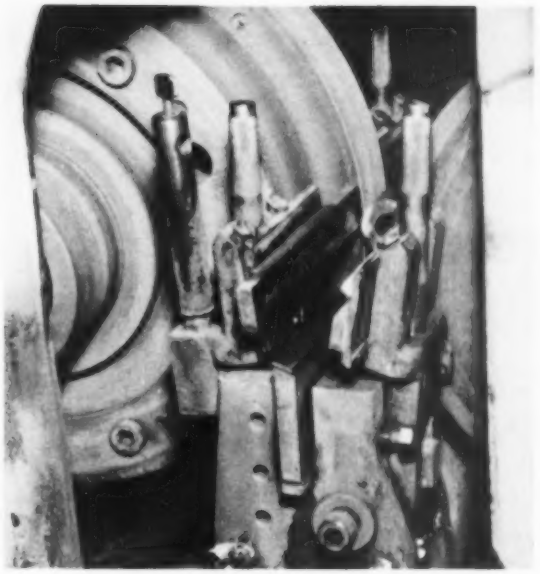
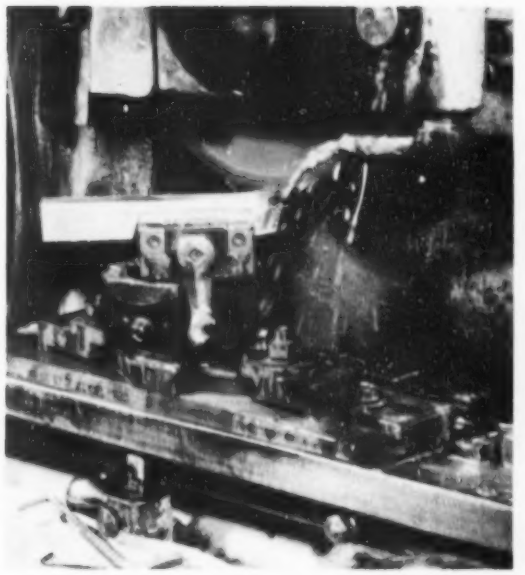
Silicon-carbide wheels can be used when surface grinding only a few carbide parts per setup, but they break down too rapidly for practical use when production grinding large lots of tools, as in this setup. Here, carbide tips must extend above steel tool shanks, as diamond wheel will wear rapidly when cutting steel surfaces



One 16-in.-OD, 2-in.-face, 120-grit, 50%-concentration, resinoid-bond diamond wheel outlasted 8 silicon-carbide wheels on this No. 2 Cincinnati centerless grinder used for roughing and finishing cylindrical cemented carbide parts to close tolerances. Despite lower cost of silicon-carbide wheels, their use could not be justified



Diamond wheels are essential when grinding chip-breaker ledges in carbide-tipped tools, so is use of coolant if best results are to be obtained without heat-checking the carbide. We prefer a 10-in.-dia wheel in a surface grinder so wheel and tool can be supported adequately. Chatter occurs if tools are not held solidly

election for Grinding Carbides

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parts are held vertically in a fixture on the table of a large surface grinder, 24 pieces to a load. Diamond wheels of 100 grit, 100% concentration, were compared with BC100-L5-VE silicon-carbide wheels. In each case the wheels were 12-in. dia, 1-in. face.

In each setup, a total of approx 2.97 cu in. of stock must be removed from the 24 pieces. With the diamond wheel, this stock can be removed in 1.776 hr per load (4.44 min per piece); using the silicon-carbide wheel, time was 36.16 hr per load or 1.5 hr per piece. Thus production rate is 20.25 times greater with diamond wheels than with silicon-carbide wheels. Wheel cost was $0.776 per piece when using the silicon-carbide wheel; it was reduced to $0.546 per piece with the diamond wheel. One $811 diamond wheel outlasted 165 silicon-carbide wheels costing $7 each.

Results achieved time after time in our tests serve to prove that a huge sacrifice in quantity, quality, and cost would result from using silicon-carbide instead of diamond wheels.

A high-production surface-grinding operation performed at Kennametal that further proves this statement is the finishing of carbide parts on a large Mattison grinder with a 12x60-in. table. This machine uses a 16-in.-dia, 3-in.-face diamond wheel with ⅛ in. of diamonds in the periphery. It cost $3,553. At first glance, this high wheel cost would seem prohibitive. But it can finish carbide parts loaded over the entire working area of the table, while every effort to grind such a load with silicon-carbide wheels has been a complete failure. The silicon-carbide wheel breaks down so rapidly that it is impossible to maintain any degree of dimensional accuracy or surface finish.

Prior to the installation of the 12x60-in. grinder, this job was done on 8x24-in.-table surface grinders. Cost records kept when diamond wheels were used on the smaller grinders show a wheel cost of $0.118 per test piece; it is $0.09 per test piece on the larger machine with the larger wheel. Thus, moving the work to a larger machine with a more expensive wheel accomplished a 25% reduction in wheel cost per piece.

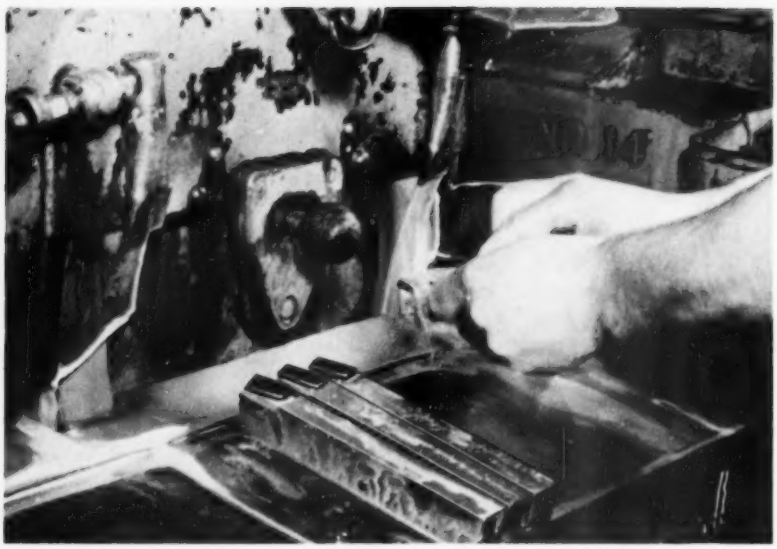
Very frequently, the least expensive diamond-grinding operations are performed with very large wheels, while the most expensive diamond-grinding operations, as far as wheel cost is concerned, are those requiring small mounted point wheels.

As a matter of record, it has been found that the wheel cost per cubic inch of carbide ground is $3.33 when using the $3,553 wheel on the large Mattison grinder. When grinding chipbreakers, using 10-in.-dia diamond wheels in a surface grinder, diamond-wheel cost will vary from $40 to $75 per cu in. of carbide ground, insofar as our experience is concerned.

This emphasizes the fact that data pertaining to wheel cost per cubic inch of carbide ground means very little unless the comparison is based on identical operations. The value will vary considerably from operation to operation within the same plant.

Another production surface-grinding operation at Kennametal that requires diamond wheels is the finishing of carbide parts loaded on the 36-in.-dia table of a No. 18 Blanchard rotary-table machine using a 18-in.-OD, 16-in.-ID, 1-in.-wide face, 100-grit, 100% concentration resinoid-bond diamond cup wheel. In this operation, the table is loaded fully and pieces are ground in the conventional manner with an ample flow of coolant through the center of the wheel.

Recently tests were made on this machine in an effort to substitute silicon-carbide segments for the expensive diamond wheel. The segments would not even start to cut a full table load of 48 pieces, so the number of pieces was gradually reduced until only 8 pieces were left. Only then did the silicon-carbide segments do any effective grinding. These 8 pieces finally were ground to size—in 4 hr. During this time cycle, 500 pieces would have been finished with the diamond wheel.



Aluminum-oxide 1½-in. face, steel-backed cup wheels are used in 14-in. Hammond double-end floorstand grinders for rough-grinding steel shank and copper brazing shim below carbide tip when preparing Kennametal tools for finishing operations. Vitrified-bond silicon-carbide wheels (generally 46 grit) also are used in these machines for roughing operations on the carbide tips. Coolant always is used

The silicon-carbide segments used in this test cost approx $30, while the diamond wheel cost $1,381. Less than 0.004 in. was worn from the diamond wheel while finishing the 500 pieces. Comparing the initial costs of the wheels, it would seem impossible for the diamond wheel to be more economical than the silicon-carbide wheel – but the cheaper wheel could not compete in performance.

Because so many surface-grinding operations are performed on cemented-carbide parts at Kennametal, repeated efforts have been made to use silicon-carbide wheels – of both vitrified and resinoid bond types. With vitrified wheels, breakdown is too severe, and irregular surfaces and heat checks have resulted too frequently to permit using such wheels for most production operations. Resinoid-bond silicon-carbide wheels have been found to do little cutting on cemented carbides, and are useless for production work.

Vitrified-bond and metal-bond diamond wheels also have been tried on surface grinders with little success. The harder bonds glaze up very quickly and produce heat checks on the carbide. Generally, resinoid-bond diamond wheels have proved to be the most effective and efficient wheels for all our surface-grinding operations.

Many things can be done to improve efficiency when using resinoid-bond diamond wheels for surface-grinding carbides. We have, for example, increased average life of DIT diamond grinding wheels 60% by using proper coolants, improving grinding techniques, and selecting wheels with proper grit sizes, concentrations, and bonds. Part of this gain, it must be admitted, is a result of constant improvement in wheels furnished. However, much can be accomplished in the shop by proper use.

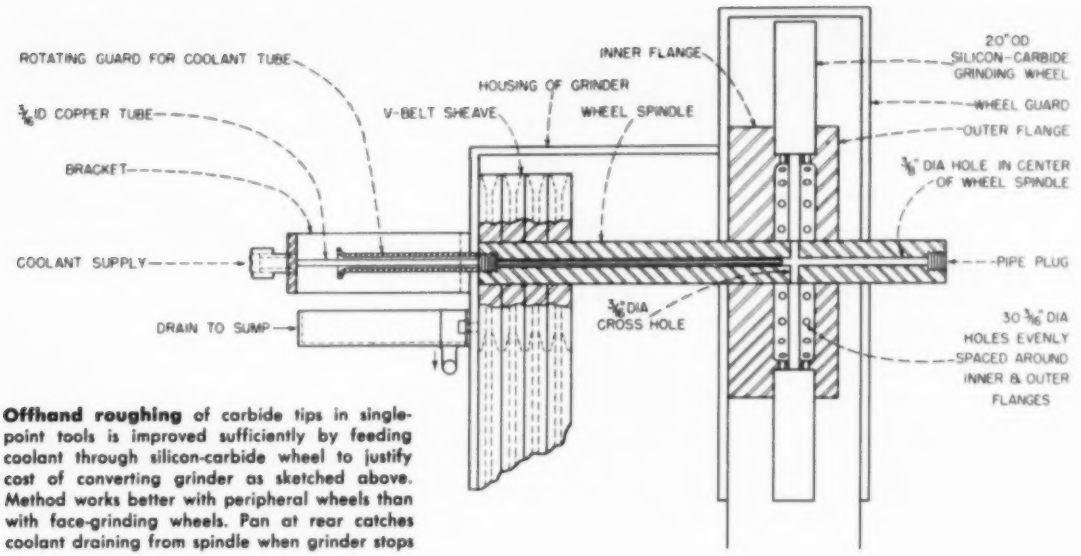
When off-hand grinding carbide-tipped single-point tools, our tests indicate that silicon-carbide wheels can be used successfully for all roughing. They also can be used for finishing cutting edges, but with some sacrifice in production rate and quality of edge produced. For off-hand finish grinding, diamond wheels will produce more tools with better cutting edges, and generally at lower cost per tool.

Where silicon-carbide wheels are used for any grinding of cemented carbide, a liberal flow of coolant is essential. One of the most effective ways of getting coolant to the surface being ground is by using the coolant-through-the-wheel principle. This is so effective in the machines Kennametal has converted (see illustrations) that we have been able to use harder grades of silicon-carbide wheels for off-hand rough grinding where the periphery of the wheel can be used. The result is longer wheel life.

Several years ago, our cost checks on off-hand grinding indicated that wheel cost per hour for 10-in.-OD vitrified diamond cup wheels was considerably greater than for 6-in.-OD cup wheels of the same specifications. Cost was $4.53 per hour for the 10-in. wheel, as compared to $2.58 per hour for the 6-in. size.

None of the 10-in.-dia wheels tested showed any appreciable improvement in this very high cost. It was concluded that 10-in.-dia vitrified-bond diamond wheels were not efficient grinding tools. Other ways of grinding larger tools were checked.

Tests later showed that the Ex-Cell-O automatic tool grinder, which uses a 6-in.-dia straight-side diamond cup wheel, does a very satisfactory job of grinding larger carbide-tipped tools – in addition to providing a sizeable increase in production. Wheel cost per hour was found to be a little over $3. As a result, we have a battery of these grinders in daily operation.



Offhand roughing of carbide tips in single-point tools is improved sufficiently by feeding coolant through silicon-carbide wheel to justify cost of converting grinder as sketched above. Method works better with peripheral wheels than with face-grinding wheels. Pan at rear catches coolant draining from spindle when grinder stops

Tests conducted on these grinders using silicon-carbide wheels in all grits from 46 to 120, and in all hardnesses from E to J, were in no way successful. In these machines, the tool is held against the face of the cup wheel by spring tension. Test results in every case showed that the silicon-carbide wheels would not cut the carbide, but would glaze very quickly.

Other tests, using resinoid-bond silicon-carbide wheels for off-hand grinding, have not proved satisfactory. This type of wheel does not seem to cut the carbide; it merely serves to polish it. It can be used for lapping cutting edges, but cannot be applied where stock removal is necessary.

Some interesting tests also have been conducted on both off-hand and surface grinding to determine differences between 50% and 100% diamond concentrations in diamond grinding wheels. It amazed us to find that these tests showed unit wheel costs in off-hand grinding are *reduced* by 25% when using 50% concentration wheels, and that unit wheel costs in surface grinding are *increased* 25% with 50% concentration. As a result, Kennametal has standardized on 100% concentration wheels for surface grinding, and on 50% concentration wheels for off-hand grinding single-point tools.

Also, for off-hand grinding with diamond wheels, it has been found that unit cost per tool is appreciably reduced by using vitrified-bond wheels as compared to resinoid-bond wheels. Also, some metal-bond wheels have given excellent results. However, most metal-bond wheels are slow in their cutting action and will show lower production rates as compared with vitrified or resinoid bond wheels. This is not always true, as a few metal-bond wheels recently tested have been found to cut almost as rapidly as do vitrified-bond diamond wheels.

In chipbreaker grinding, none of the wheel manufacturers offer a silicon-carbide wheel that will in any way compete with diamond grinding-wheel performance. In some instances, vitrified-bond and metal-bond diamond wheels give longer life when used for grinding chipbreakers, but they generally require some sacrifice in regard to finish quality of the cutting edge. Finest cutting edges can be obtained when grinding chipbreakers with resinoid-bond diamond wheels. Generally a 220-grit wheel will provide an edge that will successfully pass most specifications.

Tests comparing dry grinding with wet have shown that dry grinding cuts wheel life by one-half or more. Other than in contour grinders employing optical instruments for wheel location (flow of fluid over the workpiece would prevent proper location of the wheel) and a few other isolated cases, there seems to be no excuse for permitting dry grinding of carbides with diamond wheels. It represents a gross waste of diamonds.

Tests have shown that the type of coolant used also is an important factor in the efficiency of diamond-wheel grinding. In some cases, wheel life can be doubled merely by changing to a more suitable coolant.

In the Kennametal plant, all grinding of cemented carbides, except for optical form grinding and the internal grinding of small bores—which must be done dry—is done with an ample supply of coolant properly directed onto the wheel. After many tests, the coolant found most satisfactory for both roughing with aluminum-oxide and silicon-carbide wheels and finishing with diamond wheels, is a 60-to-1 mixture of water and a soluble-oil base specially compounded for carbide grinding. A rust inhibitor is added to the mixture.

In each grinding department, all machines are

Conversion of several 20-in. Blount floorstand grinders for use of coolant-through-wheel application of fluid to surface being ground has proved this principle the best tried to date when rough-grinding carbide tips with silicon-carbide wheels. Harder wheels generally can be used, and the wheels last longer. See sketch ←

supplied from a common underfloor sump, which has baffles to settle out grinding sludge from used coolant returned through underfloor trenches. Pumps deliver cleaned coolant to the various machines through overhead pipes. Each system is cleaned out weekly, and sludge is saved for recovery of diamond chips and tungsten powder.

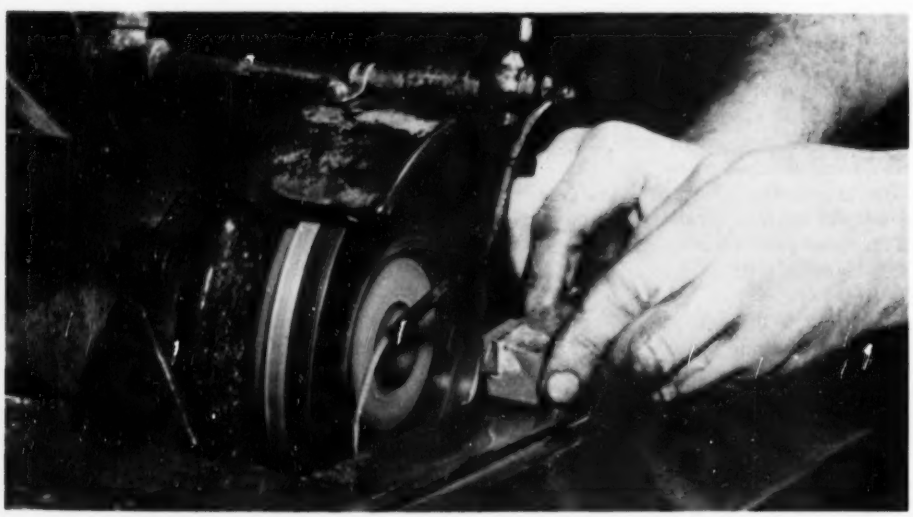
Operations that involve composite grinding of steel and carbide are another important cause of diamond waste. In a few instances, such operations cannot be avoided, but in most cases a change in design is all that is needed to eliminate this loss. Careful tests have proven that composite grinding will wear away a diamond grinding wheel 4 to 7 times as rapidly as when grinding carbide alone.

It is important that the tools and equipment used in grinding be kept in good working order. Adequate spindles in good bearings are essential to good wheel life. Proper alignment of the wheel to avoid runout and correct speeds can result in longer wheel life and lower grinding costs. Speeds, feeds and metal-removal rates should be controlled carefully.

Too often, grinding of carbides with diamond wheels is done on equipment that is too light for the operation. Wherever possible, heavier, more-rugged equipment should be used.

Proper care of wheels should be given more consideration. Too often, expensive diamond wheels are damaged by carelessness. Incorrect or too-frequent dressing often is an important factor in wasteful diamond-wheel usage. Also more effective training is necessary in many instances to acquaint operators with correct methods – and only qualified wheel men should determine proper types of wheel, wheel bond and grit sizes.

There are a great many ways by which we can stretch out the industrial diamonds available for carbide grinding; these should be explored fully before we accept less-efficient methods.



Cemented-carbide tools should never be ground dry if it can be avoided, even when diamond wheels are employed. And the more coolant used, the better. Even with 6-in.-dia diamond cup wheels used for fine finishing carbide cutting edges, as above, a full flow of coolant is considered better than drip or wick feeding

ROUND TABLE

Shop Worn

"Hey, Al, did you know that Burke just lost his job as machine-shop foreman over at Apex? That new-broom manager over there is turning out to be just as big a stinker as he looks. The story I get is that he decided Burke has outlived his usefulness and can't keep up with the times."

"I just heard about it this morning, Ed. I was talking to the employment manager about it. He felt pretty bad, but didn't see what he could do."

"Yeah, he's a milksop, worrying about his own job. Ten years ago, Apex couldn't even afford an employment manager."

"That's right—and that's the trouble. Ten years ago, Burke had only six men; now there are sixty. Apex has replaced all the old machines with new ones, added some complicated ones, tolerances are shrinking, and parts are much larger and more intricate. The personnel man says Burke just hasn't grown and progressed with the job. They offered him another job, but he turned 'em down flat. Said that after 20 years, he wasn't stepping down for anybody."

"Why should he? Did they warn him he wasn't keeping up. . . . if he wasn't? I don't see how he couldn't have. After all, the shop didn't change size overnight—he made the changes, so how could he help keeping up? What's more, he's one of the most loyal, conscientious guys I've met."

"That's right, Ed, everybody agrees to that. But the personnel man said they felt that Burke just gradually lost touch with machines, and couldn't adapt himself to modern tools and methods. What's more, he didn't keep up with the trend in handling personnel—he still thinks the whip and spur will work."

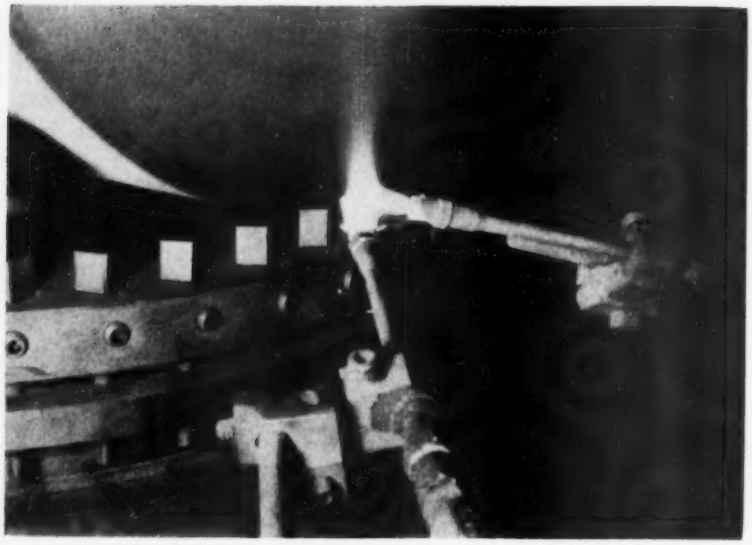
"In other words, Al, he wouldn't mollycoddle the loafers, as it seems so popular to do! Sounds to me like he either played his politics wrong with the new manager, or the company was just trying to get out of paying retirement pay."

"No, the personnel man says neither of those is true. Burke has ten good years in him yet, and the new manager likes him. But they just couldn't figure out what to do. They couldn't put him back on labor, without upsetting all the other foremen. They couldn't make him a methods man—because his ideas on methods are out of date. He wouldn't accept a job with less prestige or income, or reduced responsibilities."

"Look, Al, why should they chop *him* down? Plenty of big wheels end up as figureheads, with assistants who do the work. Or they could give him some job to keep busy on."

"That's what they were trying to do, but Burke wouldn't have it. He saw through the idea—and quit. Now everybody's upset and nobody knows what to do."

***WHAT CAN** be done with the executive whose job outreaches him? What are the company's responsibilities? How can the situation be handled fairly and smoothly? Your ideas and opinions on this subject will help others. Discussions of earlier topics appear on later pages.*



OUTSTANDING APPLICATION OF CO_2 cooling is this setup on a 25A rotary-table surface grinder for rough grinding ends of square or triangular solid carbide inserts to remove damaged sections. Two 0.012-in. orifices direct CO_2 under the 18-in.-dia, 2-in.-face, 3C-60-H8-V2, silicon-carbide wheel which operates at 6000 sfpm. Depth per pass is 0.001 to 0.0015 in.—was 0.0001 to 0.0002 in. per pass when soluble-oil coolant was used. The fixture holds 37 bits per setup. Use of CO_2 cut machine time 75%

Cadillac teams CO_2 with silicon carbides

Minimized use of diamond grinding wheels, cleaner working conditions, virtual elimination of heat damage to cemented carbide sections, and longer carbide tool life are assured when CO_2 cooling is applied properly to tool sharpening

BY T N CHAMBERS, general supervisor and JOHN KWOLEK, engineer, Process Development & Test Section, Methods & Equipment Div, Cleveland Tank Plant, Cadillac Motor Car Div, GENERAL MOTORS CORP

Correctly positioned jets of carbon dioxide have proved economical for cooling in carbide-tool sharpening in the main tool crib at the Cleveland Tank Plant, currently being operated for the Ordnance Corps by Cadillac Motor Car Div, General Motors. CO_2 cooling permits silicon-carbide grinding wheels to do some operations formerly possible only with diamond wheels, and has boosted the efficiency of other operations formerly done slowly with silicon-carbide wheels.

In addition, tests made by our section have proved that CO_2 cooling has virtually eliminated heat damage to carbides ground in machines converted to use this cooling medium.

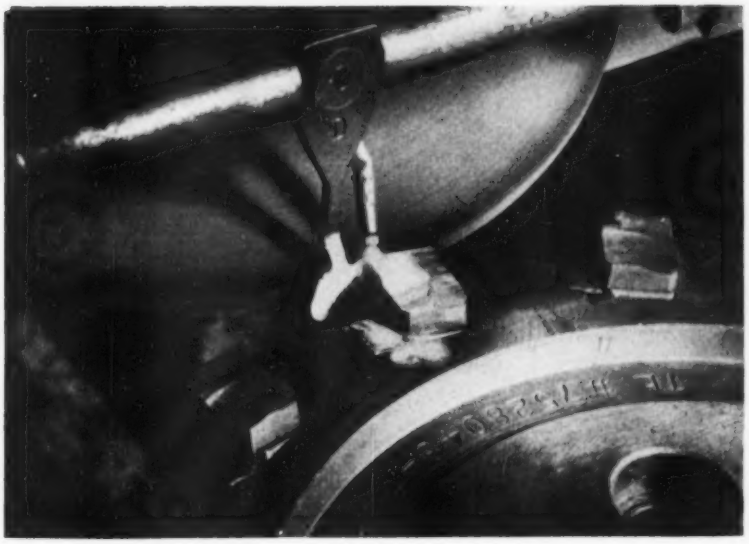
Furthermore, CO_2 as a coolant eliminates need for applying liquid coolants to many tool grinders, and so minimizes machine cleaning and liquid coolant-control problems. And once they become accustomed to its characteristics, grinder operators like CO_2 as a coolant—it is so much cleaner than any of the suitable liquid coolants.

Despite the high cost of CO_2 ($0.03 to $0.04 per lb in bulk, to $0.07 per lb in small containers, depending on type and quantity used), as compared with liquid coolants, its use can make possible direct savings in cost per tool ground if proper precautions are taken to hold waste to a minimum. For example, flow of CO_2 to the orifice should be permitted only when grinding—valving must be provided to stop the flow of CO_2 when grinding is halted for tool inspection or adjustment.

Size and type of spray nozzle used, and its location with respect to the point of contact of wheel and work, also are important.

For some applications, inexpensive round-orifice nozzles are satisfactory—Cadillac has been using with some success inexpensive brass pilot-light orifices made for domestic gas ranges. But for other jobs, special nozzles are needed. For example, a fan-type nozzle is most efficient for off-hand grinding of single-point tools, because it permits full coverage of the wheel face with a thin spray of CO_2.

Size of orifice in the nozzle determines rate of CO_2 usage, so it must be selected carefully to insure proper cooling without waste. Tests have shown that at 70 to 75° normal room temperature, orifices



A 0.012-IN. ORIFICE directs CO_2 at the grinding station of this setup for rough and finish sharpening of 10-in.-dia, 14-tooth, carbide-tipped cutters. Resinoid bond, 60 grit, N grade, silicon-carbide wheels, 10 in. in dia with ¼-in. face are used at 6000 sfpm. Roughing passes remove up to 0.010 in. stock per pass, result in about 16 mu in. rms surface. Finishing passes are held to 0.001 to 0.002 in. per pass and result in 6 to 8-mu in. finish after sparkout. Tolerances are 0.0003 to 0.0005 in.

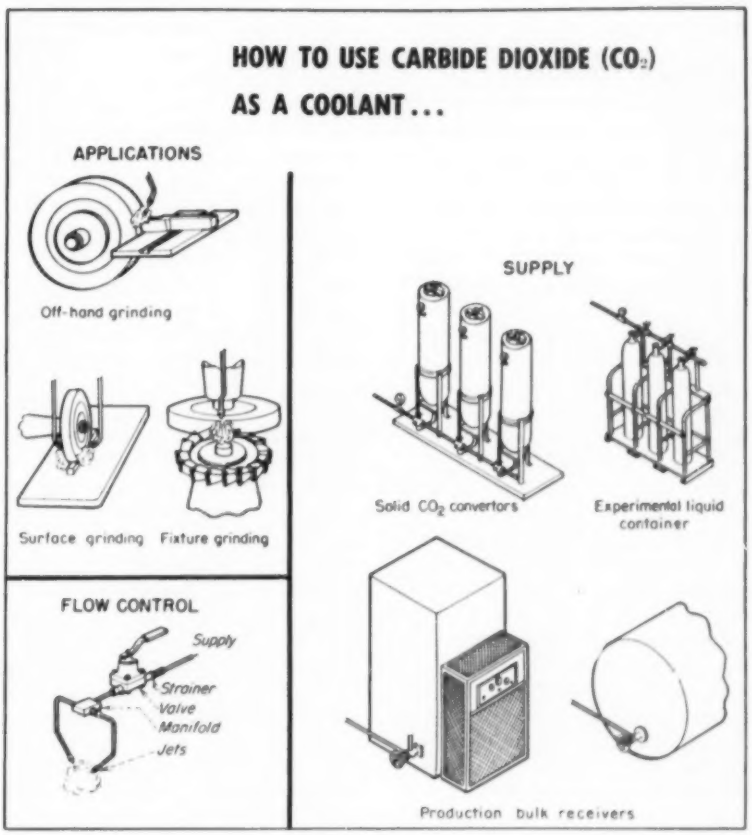
to grind carbide tools better

of different sizes will pass the following amounts of CO_2 when liquid CO_2 is piped to the nozzles at about 900 psi and 0F:

ORIFICE DIA, IN.	OZ CO_2 PER MIN.
0.009	2.5
0.012	4.7
0.015	8.7

Carbon dioxide can be purchased in solid or liquid form, cost being determined by containers used and volume needed. When received in solid form, it is converted to liquid in a pressure-sealed "liquidor" or converter at approx 800 to 1000 psi.

Conversion is eliminated when the CO_2 is purchased in liquid form, and pressure control is achieved with high-pressure pumps. From the liquid supply source, the CO_2 is piped directly to points of use—remaining in



APPLICATION OF CO_2 COOLING to grinding operations is not difficult, but careful attention to details is essential if highest efficiency is to be achieved for each setup. High-pressure (800 to 1000 psi) supply is necessary to eliminate vapor locks, and to keep valves, strainers and orifices free of "snow"

liquid form until permitted to expand rapidly by passage through a discharge orifice.

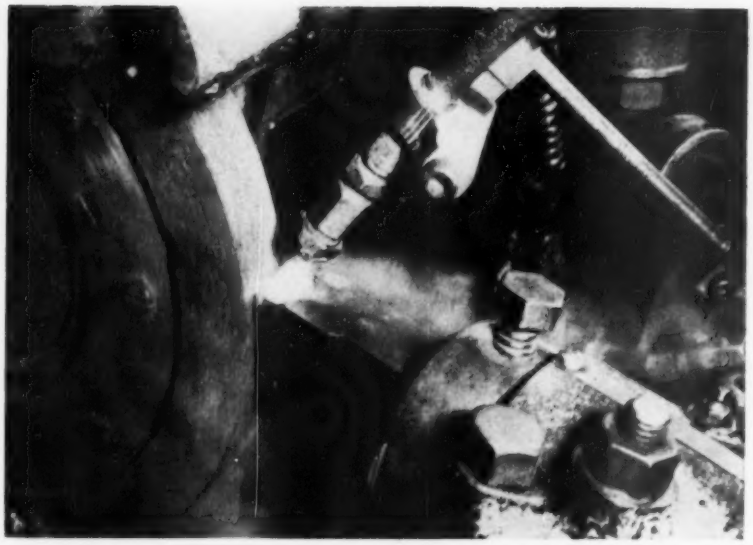
As it leaves the supply line through the orifice, the liquid CO_2 transforms into very small particles of "snow." If this transformation takes place partially within the orifice, stoppages may result because of buildup of snow deposits. Experience has shown that high pressure (800 to 1000 psi) supply tends to blow the orifices clear of snow deposits, while lower pressures lead both to plugging of orifices and development of vapor locks in supply lines where heating of the liquid by conduction from outside sources causes gas to form.

But movement of the snow through nozzle orifices at high pressure leads to abrasive wear and enlargement of the openings. Thus, the volume of CO_2 passing through a given orifice will increase gradually with resultant higher cost per tool ground. We are, therefore, planning to substitute stainless-steel nozzles for the brass nozzles originally installed.

Temperature Control

Positive temperature control is one of the important advantages of using CO_2 as a coolant when grinding cemented carbides and other hard materials. This permits minimizing or eliminating the development of thermal stresses in the tools as they are sharpened. Nozzles are positioned to direct the flow of CO_2 directly at the grinding position, and are located ¼ to 3 in. away, depending on the operation and the area to be covered by the spray.

Proper application of CO_2 permits visual control of grinding, and in almost every case grinding of a given tool can be completed in one cycle—there is no need to put the tool aside for cooling before the job is finished, as is so often necessary when dry-grinding carbide tools with silicon-carbide wheels. Wheel life is increased materially, redressing of the wheel is cut to a minimum, and finishes obtained are considerably smoother.



ROUGH GRINDING of many of the heavy carbide-tipped tools for machining tank parts is performed in semi-automatic oscillating grinders with C60-18-YV open-structure silicon-carbide wheels (15-in. dia, 1⅜-in. face) at 1317 rpm. CO_2 is applied with 0.013-in.-dia nozzle. Scrap loss from heat checking has been eliminated

Open-structure (Buxite-treated) silicon-carbide wheels generally cut better than do the more conventional close-structure wheels. Also, slightly harder wheels can be used. In general, there is little difference in cutting action when the wheel is grinding the carbide or the steel shank of a tipped tool. Both vitrified and resinoid bond wheels can be used, depending on the work to be done.

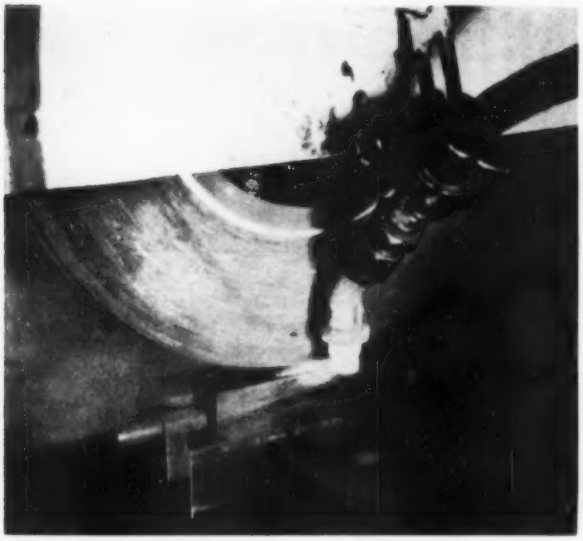
Laboratory tests, performed before the process was approved for production resharpening of carbide tools, have in every case proved the desirability of using properly engineered CO_2 setups in preference to dry grinding methods.

In one test, using a C60-J9-V, open-structure, 20-in. dia, 2½-in.-face wheel in a floorstand grinder for peripheral rough grinding of heavy carbide-tipped tools, grinding time was reduced from an average of 18 min. per tool when dry grinding to an average of 5 min. per tool when using CO_2. No tool could be completed in one operation when dry grinding—each time the tool had to be set aside for cooling when only partially finished. About 8% of the tools dry-ground were found to be heat-cracked. None of the tools ground with CO_2 were heat-damaged, and none were set aside for cooling prior to completing the operation.

During the dry-grinding portion of the above test, the wheel loaded and glazed rapidly, requiring 11 redressings during the test run. When grinding the same number of tools with CO_2, the wheel was dressed only once, at the start of the test, and no redressing was needed during the run. Finish obtained when dry grinding was rough (60 to 125 mu in. rms Profilometer reading)—using CO_2 under the same conditions resulted in finishes of 16 to 32 mu in. rms, far smoother.

Using the same machine, again with a C60-J9-V Buxite-treated wheel operating at 5500 sfpm, for off-hand grinding ⅜ x ½-in. K2S carbide tips brazed on 1½ x 2-in. steel shanks with the wheel cutting both the carbide and the steel, the following temperature readings were obtained at the end of continuous grinding times indicated:

TIME IN SECONDS	DRY-GRINDING TEMP, F	CO_2 GRINDING (0.010" Orifice) TEMPERATURE, F
15	190	170
30	200	150
45	235	110
60	250	155
90	265	150



SOLID CARBIDE INSERTS are clamped in holding fixture for finishing ends in this 8 x 24-in. surface grinder. Two 0.010-in. orifices, one on each side of wheel, supply CO_2. Depth per pass ranges from 0.025 to 0.010 in., with 0.035 to 0.005-in. cross feed per pass, depending on finish and accuracy required. Silicon-carbide wheels are used: for roughing, 3C-80-16-V2, 10-in. dia, 1-in. face beveled at 45° on each side for ½-in. cutting face—for finishing, 39C-100-J8 in the 10-in. dia beveled wheel, or GC-100-G11-VR in a 7-in. dia, ½-in. face straight wheel. Speed, 2340 rpm. Finish obtained, 4 mu in. rms

ROUGH OFF-HAND GRINDING of heavy carbide-tipped tools is performed on the periphery of an open-structure, 20-in.-dia, 2½-in. face, 60-grit, silicon-carbide wheel. Single nozzle has 0.015-in. dia fan-type orifice which covers face of wheel with spray. Spray is controlled by pedal valve beside machine, can be shut off when not needed. Operator not troubled with CO_2 burns on fingers, because spray is confined to work area for both safety and economy

TIME, SEC	TEMP DRY, F	CO_2 TEMP, F (0.015" Orifice)
15	240	120
30	260	110
45	310	115
60	290	105
90	315	110
180	325	115

After 3 min. of continuous grinding with CO_2, the carbide tip could be held on the palm of the hand without discomfort, but the tip of the dry-ground tool was much too hot to handle.

A spot check of temperature rise during a heavy grinding operation was also made on a 8x24-in. table surface grinder equipped with a GC100-J11-VR, open-structure, 10-in.-dia, 1-in.-face, silicon-carbide wheel. After grinding one spot dry for 30 sec the K2S carbide block reached a temperature of 485 F; after grinding for the same length of time with the same wheel, but using two 0.010-in. orifices (one at each side of the wheel) to direct CO_2 at the contact area, workpiece temperature was only 90 F. Surface checks were produced as a result of the high heat of the dry grinding operation —but the CO_2-cooled piece was not damaged by the grinding.

Today a number of carbide tool- and cutter-grinding operations regularly are being performed at the plant with CO_2-cooled silicon-carbide wheels. In some cases, these are roughing and semi-finishing operations previously performed dry with silicon-carbide wheels; in others roughing and finishing operations formerly done with diamond wheels now are performed efficiently with silicon-carbide wheels. The more important of these operations are shown in accompanying illustrations.

IF YOU'D MOVE THAT SELF-STYLED-SO-CALLED DESIGNER AWAY FROM TH' WINDOW-YOUD GET BETTER TOOLS-ALSO-YOU'D SAVE ME FROM AN ICY GRAVE TRYIN TO FIND & CHECK THE JUNK PARTS HE USES, THIS KIND OF WEATHER ESPECIALLY!
"COPY BOY"

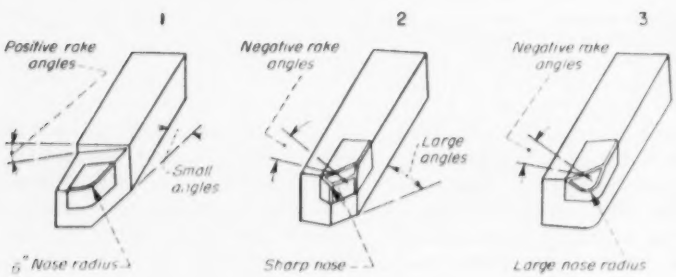
HOW GE WORKS TITANIUM

BY V L COUGHLIN, Aircraft Gas Turbine Div, GENERAL ELECTRIC CO, LYNN, MASS

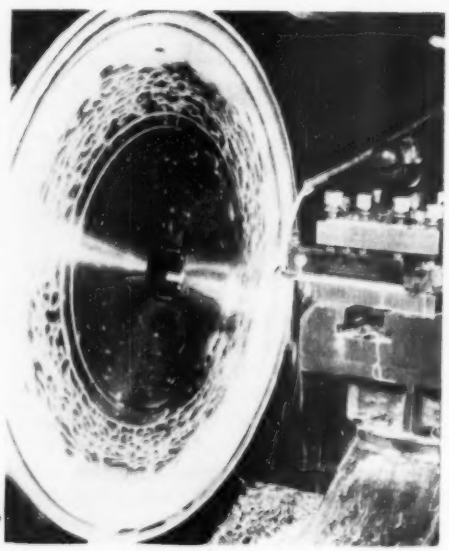
Titanium alloys Ti-150A and Rc-130B are being forged and machined in the production of jet-engine parts in the Aircraft Gas Turbine Div of General Electric. We have found that designers must do their best to fit their designs around titanium from a structural and machining standpoint. In most cases it is not practical to take a part designed for steel, change from steel to titanium, and hope to use it to best advantage.

Surface imperfections must be guarded against in working titanium alloys. Low impact energy to fracture makes them particularly sensitive to grinding scratches, small machined radii, tungsten inclusions, pits from sandblasting or residual stresses.

Working titanium below 1300 F tends to lower ductility while increasing strength. Cold work effects and internal stresses can be removed by heating to 1100 to 1300 F for a short period and cooling slowly. Water quenching will harden the surface about 10 points R_c, but the hardened zone is too shallow to contribute to wear resistance or strength of the part.



CARBIDE TOOLS for cutting steel (No. 1) and titanium (No. 2 and 3). For Titanium, 5° negative rakes with heavy cuts and slow speeds have given good tool life and reasonable machining costs. These tools are the result of dynamometer and temperature tests of various designs. Because titanium dissipates heat slowly, tools are designed for as large a chip-contact area as possible



TURNING a titanium disk. The tool should have minimum overhang and be rigidly supported

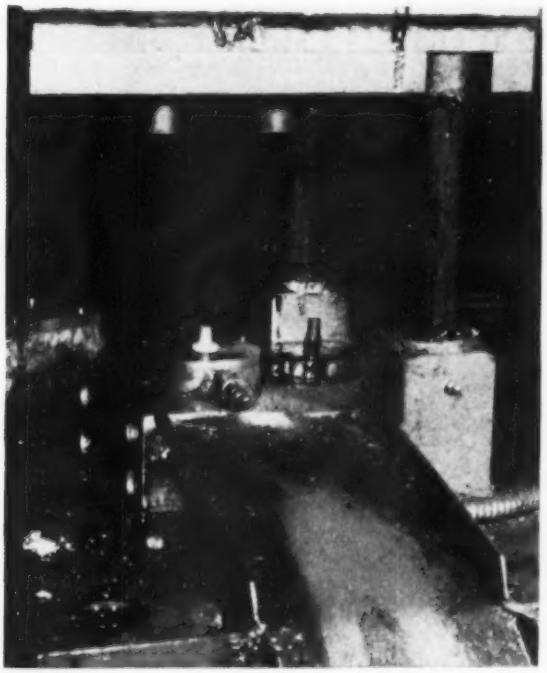
TURNING

IN MACHINING TITANIUM, one of the main problems is a tendency of the metal to gall or weld to the tool. Work hardenability is another troublesome factor especially if the work is allowed to revolve against the tool when not cutting. The alloys are especially abrasive, resulting in tool wear.

Approximately 20% more machining time is required than with steel. Work and tool must be held rigidly. Coolant should be water-soluble oil with a 10 to 1 ratio. This ratio is critical for good tool life and as a precaution to eliminate fire hazards.

When turning between centers, live centers are desirable. Dead centers will gall and seize when used with titanium.

For two years, GE has been carrying on development work in fabricating titanium parts for jet engines. Many new ideas have been tried—here is a summary of the ones that worked



UPSETTING in a press is performed at 1600 F. Temperature is controlled with an optical pyrometer so it does not exceed this limit. At higher temperatures, titanium tends to absorb impurities rapidly and is subject to grain growth, causing embrittlement

BLOCKING is done in 800- to 2000-lb hammers, depending on the size of the work. Blades are hot trimmed and tumbleblasted before finish forging to remove scale and surface hardness

FORGING

FORGING JET ENGINE BLADES from titanium requires stock that has been centerless ground, is free of cracks, and has a maximum hardness of 37 R_c.

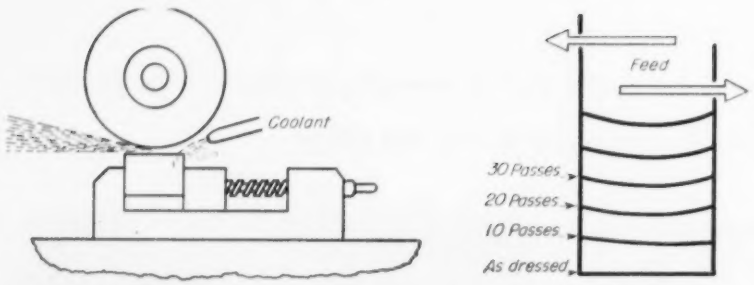
Bar stock is cut to length in a high-speed steel hack saw. For minimum surface contact we use 6 teeth per in. with a speed of 31 sfpm and a feed of 0.015 ips. A water-soluble sulfurized oil, mixed 10 to 1, is a coolant. Shearing at first appeared impractical, but we have found that by heating bars to 400 F, as they enter the shear, a clean cut that is free from cracks can be obtained.

Swaging is done at 950 F, part of the heat being produced by an induction coil, the rest by working the metal. Care is necessary to avoid surface folding that will weaken the part.

Forging dies should be designed with large contours so that metal will flow easily. Small radii should be avoided. A high polish is required on dies. A good lubricant is large portions of graphite mixed with grease.

After blocking, blades are hot trimmed and tumbleblasted to remove scale and surface hardness. Procedure in finish forging is similar to blocking. We find that reheating is not harmful as long as tumbleblasting is used to remove the hard skin caused by oxygen contamination.

GRINDING



TO PROCURE DATA on wheel wear and stock removal this method is used. Twenty passes back and forth across the specimen are necessary in order to shape the wheel before any measurements of wheel wear are made

IN GRINDING we are basically interested in obtaining a desirable finish at a reasonable cost. With titanium, the problems in obtaining this result are aggravated by excessive wheel loading, poor finish, inability to hold size and high wheel wear.

Surface grinding in an application requiring approximately 0.010-in. stock removal gives a 10 to 1 grinding ratio—or 0.010-in. stock removed for each 0.001 in. of wheel wear. Surface finish is 16 μ in. rms with a 60-grit wheel at a reduced speed of 2000 sfpm and a water-soluble oil reduced 10 to 1. To reduce wheel wear and improve accuracy, the choice of coolant is critical. We have found the sodium nitrite-amine water-soluble coolants adequate.

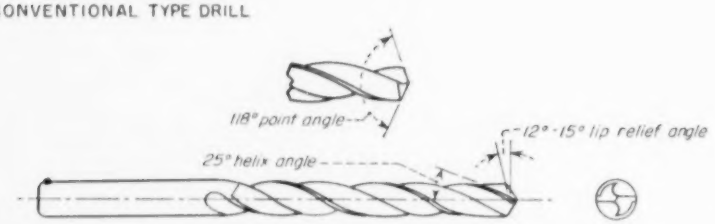
Because titanium is not magnetic, work must be held by mechanical chucks or by strapping to a faceplate. We have found mechanical chucks most satisfactory.

Optimum wheel speed is reached when wheel sparking is minimized. Titanium is susceptible to grinding cracks. These can be detected by etching with 10% hydrofluoric acid for one minute.

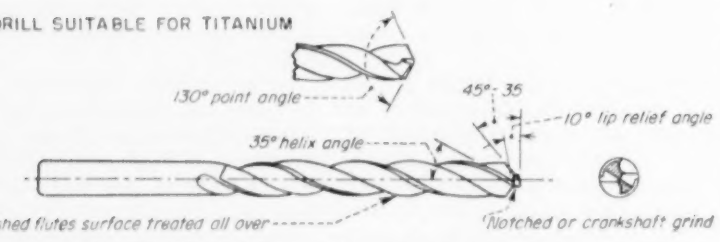
To prevent center galling, centers should be oxidized by heating to 1300 F not more than 2 hr. For improved speed, the wheel should oscillate slightly. If parts are distorted prior to grinding, stresses can be relieved by heating to 750 F for 2 hr.

DRILLING

A CONVENTIONAL TYPE DRILL



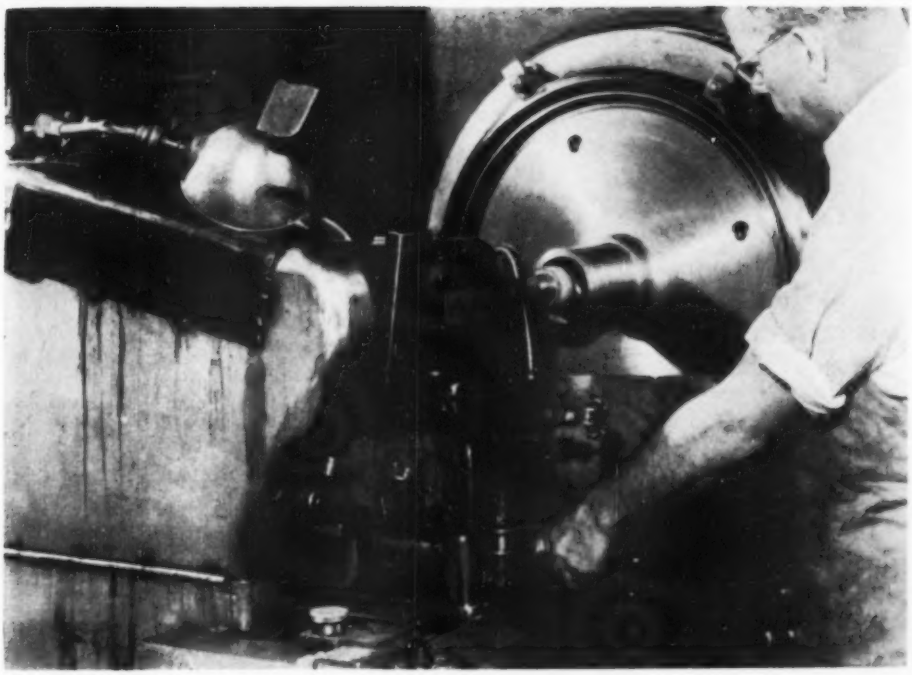
A DRILL SUITABLE FOR TITANIUM



COMPARISON of a conventional drill for stainless steel and one for titanium shows the decided change required. Tool material is a vanadium-cut steel. Cutting speeds are 20 sfpm with a feed of 0.006 to 0.009 ipr depending on diameter

TO MEET the requirements of accurate sizing with long drill life, three types of drills have proven satisfactory. One has an oxide surface treatment; the other two are chrome plated. All of these drills have produced over 400 holes in $\frac{5}{8}$-in. titanium bar stock and are still in good condition.

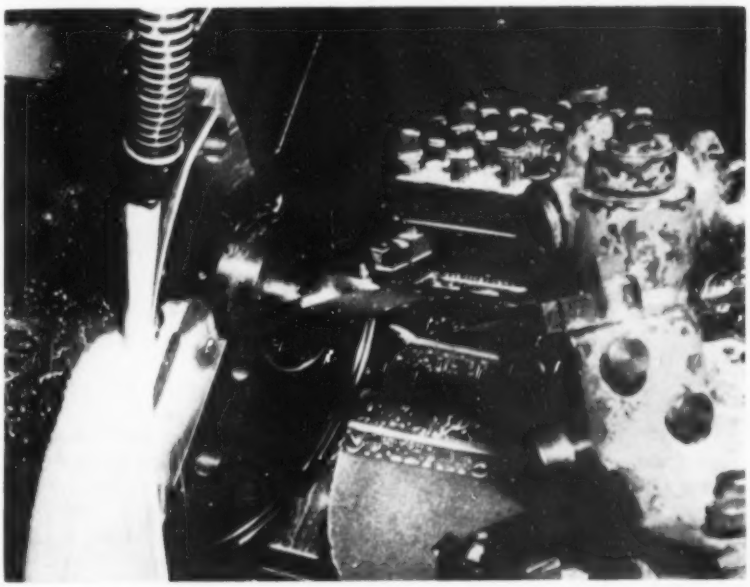
A heavy sulfur-base oil appears to be best as coolant. Whenever possible power feeds should be used to prevent work hardening. Pilot holes have proven inadvis-



BOTH INTERNAL AND EXTERNAL grinding are required on this disk. For the external grinding, work speed is about one-third faster and wheel crossfeed double that for internal grinding. For internal grinding generally, wheel speeds are reduced with light wheel feeds in the range of 0.0005 to 0.001 in.

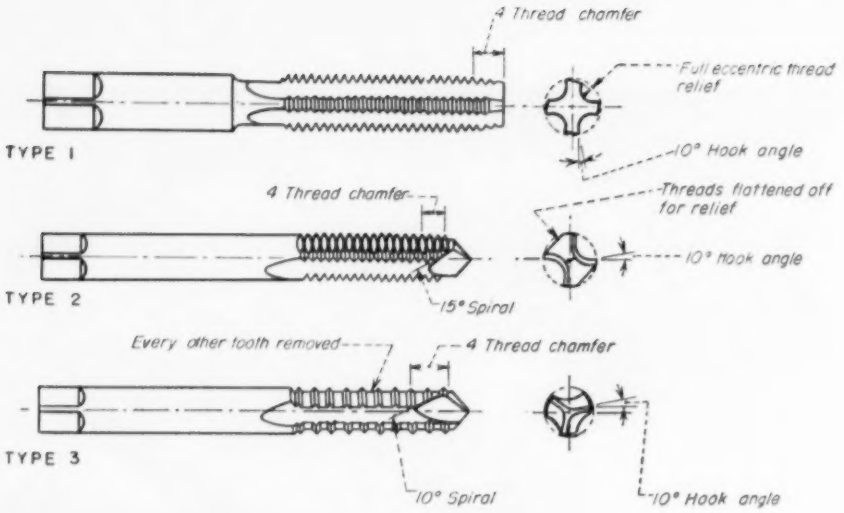
able because of work hardening. Work should be rigidly supported and machined with short series drills and heavy feeds. As in other machining operations, drilling is most satisfactory when hardness of the work is below 37 R_c.

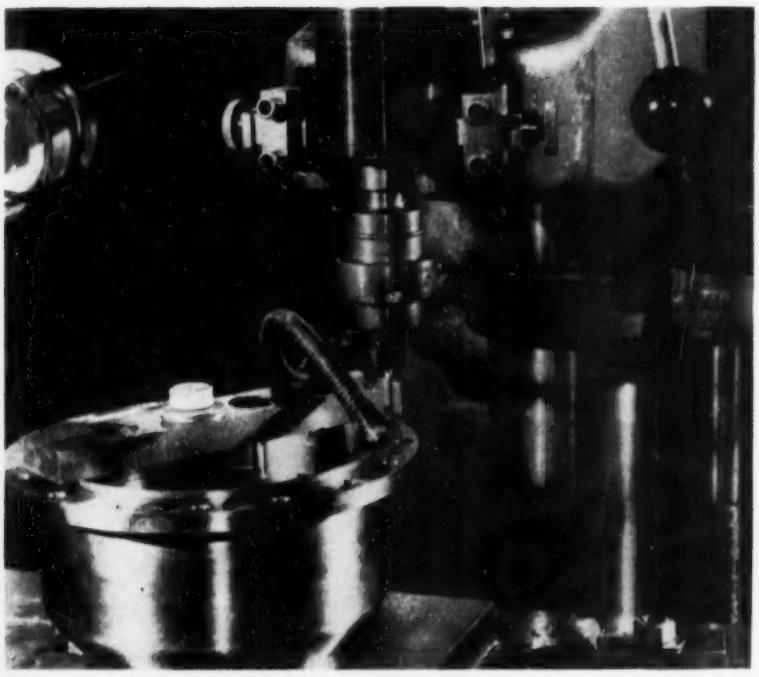
Drill jigs of conventional design require at least twice the clearance between the work and drill bushing needed for steel. We believe this chip clearance is required by the straight, stringy chip characteristic of titanium.



DRILLING a 1¼-in. hole in a bearing housing with a standard titanium drill. Such relatively large holes have been drilled with no particular trouble except that time required is about 30% greater than for steel

TAPPING





BASIC TAP DESIGNS that have been successful. Type 1 is a 4-fluted tap which has produced more than 150 Class 3 tapped holes with 75% thread without resharpening. Size was excellent. Type 2 is a 2-flute tap which has produced 75 tapped holes without resharpening. In order to decrease the pressure on the tool, the tops of the threads have been flattened to provide less surface contact with the work. Type 3 is a 3-flute tap. Every other tooth has been removed to decrease pressure on the tool, allow for freer cutting, longer tool life, and increased accuracy. This type of tap has produced more than 200 holes with good size. Though still capable of producing, it has been found more economical to resharpen for longer over-all life and accuracy

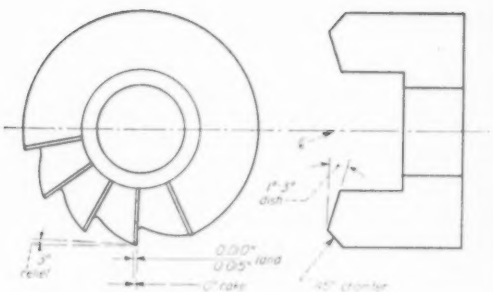
COUPLING is typical of tapping jobs and shows the rigid setup required. Requirements are a Class 3 tapped hole with 75% thread. The ¾-in.-deep blind hole is tapped to the bottom on a leadscrew tapper

TAPPING has proved to be the most difficult machining operation. Major problems are galling or seizing of the tap, or a tendency to build up on the cutting edge; shrinking action of the hole after tapping; and tap breakage from the tremendous pressure brought to bear when drilled holes vary even slightly in their diameter.

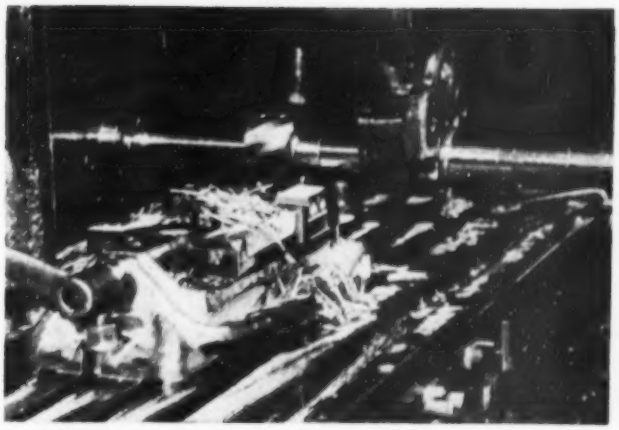
Several tap designs have worked (see drawing) but many tests on radial drills, upright drills, and leadscrew tappers point to a 3-flute, skip-tooth tap.

Greater accuracy and reduced tap breakage are obtained with power tapping. Rigid setups are a must. Holes drilled with dull drills will cause tap breakage. To facilitate cutting, thread requirements should be reduced to 60-70% if possible.

Optimum thread engagement is 1½ times tap diameter. Greater thread engagement does not increase the strength of the part.



TOOL GEOMETRY of milling cutters for titanium. The 45° chamfer on cutter corners helps to dissipate heat and retain the cutter edge



SLAB MILLING BLANKS for titanium lugs. Cutter is high-speed steel. Rigid setups are required for longer tool life and accuracy

MILLING

MILLING titanium presents the problem of retaining sharp cutters, preventing buildup on tools, and eliminating work hardenability. In our experience we have found that heavy cuts, low speeds, and coarse feeds are a must. The machine should be as rugged as possible with ample horsepower to take the load.

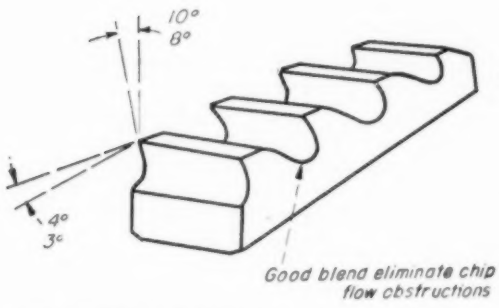
Best results have been with 18-4-2 high-speed steel. Tungsten carbide has not proved sufficiently tough to withstand the intermittent cuts combined with high pressures.

Climb cutting is most effective with power feeds giving longer cutter life. We face mill whenever practical. Rigid setups are required for longer tool life and accuracy.

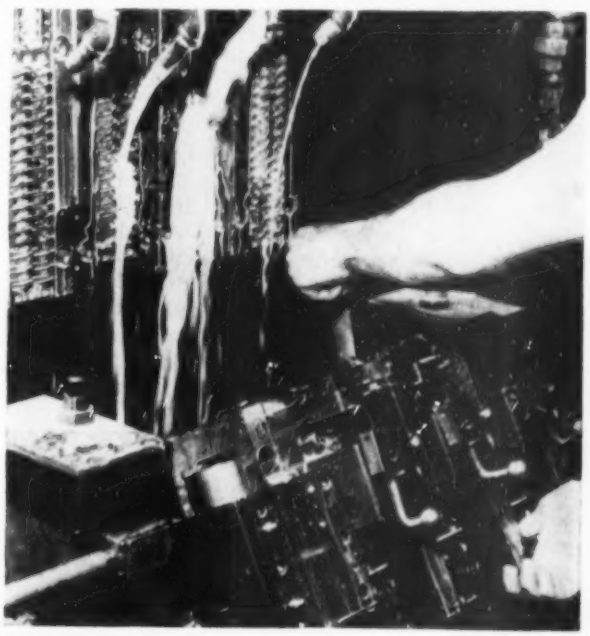
The tool should be retracted from the work when the cut is finished or it will flake and chip.

BROACHING

TITANIUM with high Rockwell hardness tends to bind and resist broaching. Work is held to 37 R$_c$. Broaches that require only one pass are used with rigid setups for tool and work.

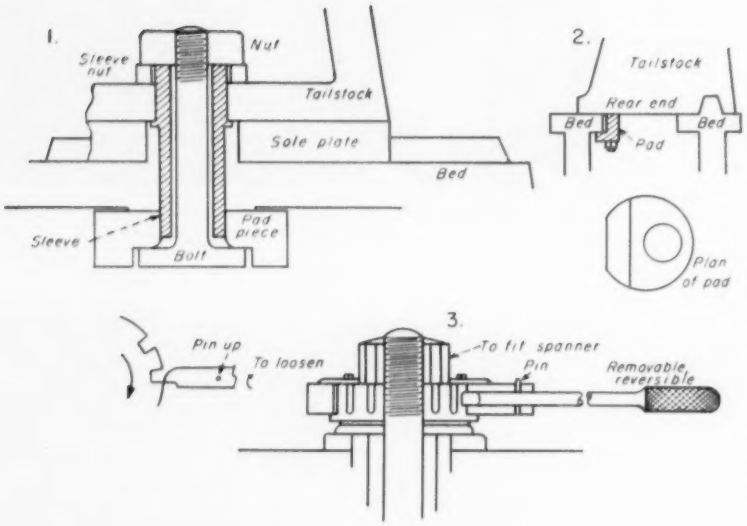


TYPICAL BROACH SPECIFICATIONS. Grinding of these broaches is critical. We grind them wet and superfinish the cutting surfaces



BOTH DOVETAIL AND ANGLE BROACHING of titanium are used. Forgings are not harder than 37 R$_c$ and give 16-mu in. rms finish with no tears. About 800 pieces are produced per grind

Practical Ideas



Lathe Tailstocks Can Be Improved

The lathe tailstock seems to receive less design consideration than any other part of the machine. They are regarded as work-end supports or as drilling attachments, rather than as an integral part of the machine essential to the proper and accurate functioning of the entire unit. With some thought, the tailstock could perform many other operations now not even considered by most users.

Three faults are common: The pad-piece used to lock the tailstock to the bed is slotted a free fit for the locking bolt and hangs loosely thereon, so that unless the locking nut is very loose, the pad tilts slightly as it follows the movement of the sole plate and momentarily binds the tailstock to the bed. This is annoying to the operator, time consuming, and can cause trouble when setting up heavy work or when using the tailstock as an extra tool carrier.

A second fault is peculiar to tailstocks sliding on one V-guide and one flat way, although it is sometimes found in other styles too. Normally guided by the inverted "V", when the clampbolt is slack the tailstock is held in alignment only by its weight. Hence, when it is gripped by the handwheel to move it, the tailstock wobbles on the ways. This characteristic is especially true when the tailstock is carrying a heavy reamer, drill, or a tailstock turret.

Number three complaint is that even today very few lathes are equipped with instantaneous locking devices. Makers still rely on the plain nut, bolt, and pad piece. Frequently, wrench space is limited, especially when the tailstock is close to the carriage saddle.

Stop Binding

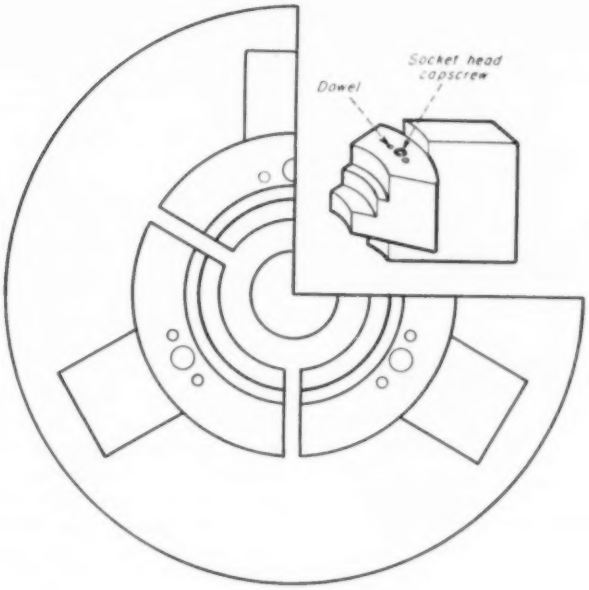
We have modified our tailstocks to overcome these faults and the improvement in lathe operation is surprising. To cure momentary binding, the slot in the pad piece is filed or milled to a standard size and the tailstock sole is bored 3/16-in. larger. Then a short sleeve is made to a snug fit in the hole bored in the tailstock base. This sleeve is shouldered and threaded for a short distance at one end. A thick, tapped washer is made to fit the sleeve, and the sleeve is passed up from the bottom of the tailstock sole and screwed into the washer. Then the tailstock is reassembled as usual. Binding is eliminated as the sleeve, passing into the pad-piece slot, carries the pad-piece ahead of the bolt.

Wobble was stopped with a simple one-screw fixture in the form of a stepped-pad. This pad, preferably of brass, is fitted at the rear of the sole plate as shown and prevents the rear end of the tailstock from lifting, hence the body cannot rock. Alignment is not affected.

Fast Clamping

For instantaneous clamping, we made the ratchet lock shown which consists of a new nut having ratchet teeth cut on it and its top extension flattened to fit a spanner, in case extra pressure is necessary. Ratchet teeth are numerous and the ratchet body is cut from solid, with its width minimized to allow maximum arc of movement. Ratchet pin and handle are in one piece and a plain sliding fit. Nut and pin are hardened. Correct engagement and direction of movement are determined by a small pin fitted to the handle which fits a slot in the ratchet body. Pin pointing up, or down, indicates direction of movement.

Tailstocks, properly supported, can serve many useful purposes. In addition to drilling and tapping operations, the tailstock can be used to carry a turret for other kinds of end-working such as facing and boring, as well as knurling and slotting. *Ian J Peacock, Cumberland, England*

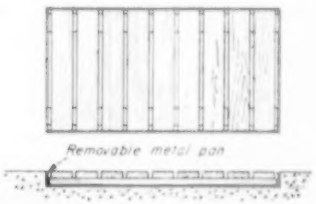


Soft-Jaws Act Like Step-Collet

In boring bearing fits, telescopic fits, and in facing and chamfering operations on small motor end-bells, along with many other turret lathe operations on die or sand castings, three soft-jaws mounted on the chuck and bored in place worked very well. We made the soft-jaws as a whole, turned the OD to size, roughed the steps, and *then* split the ring into three segments. The saw-cut provided clearance for closing the jaws on the part. These jaws are mounted on the chuck jaws with one capscrew (socket head) and two dowel pins each. They are then bored in place on the turret lathe, using a round bar of the proper size clamped in the supporting jaws of the chuck while the boring is done. Thus, we have several different sets of jaws interchangeable to the mounting jaws and these jaws may be re-bored over and over again when they lose concentricity or are nicked. *Roy Melvin, Waterford, Wisc*

Duckboard Well Prevents Accidents

Most modern machine shops utilize concrete floors to assure a solid foundation for the equipment at minimum cost. However, machine operators frequently object to standing directly on the concrete for long periods and will place duckboards in front of their machines to avoid direct contact with the floor. In some shops these boards are accurately measured to suit the operator's height so that he is properly positioned at the machine. In spite of this there is a constant danger to people passing the machine, as they may accidentally stumble over the duckboard. Also it is frequently an objectionable obstacle to moving skids and pallets by handtruck.

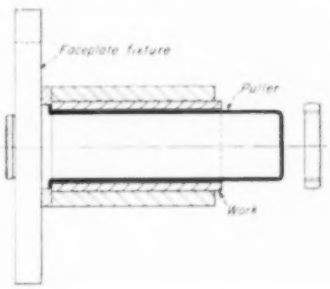


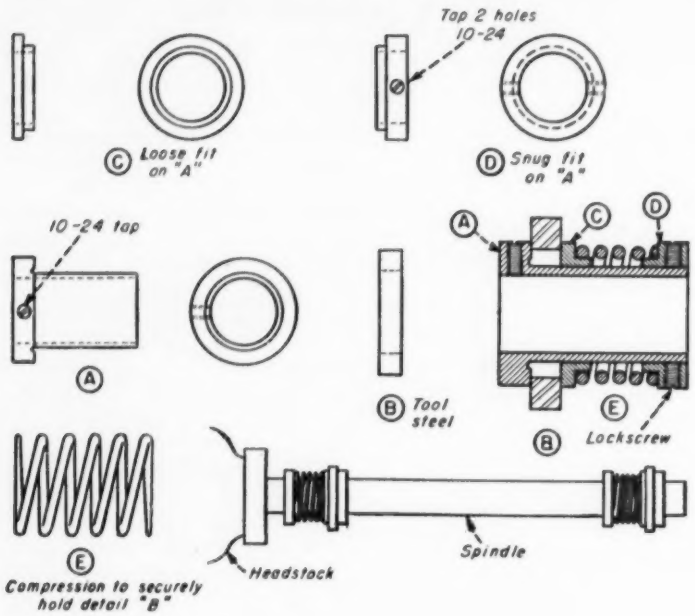
To overcome this danger, it is sometimes practical to place a well of suitable area and about 2-in. deep in the concrete in front of each machine. To facilitate cleaning, place a resasonably close-fitting sheet-metal pan in each well. In this pan place the duckboard, just flush with the normal floor level. This idea can be extended to the front office and even to the home, for neatly locating the coconut doormat or its equivalent. *Harold Waring, Hawthorne, NJ*

Makeshift Grab

When boring or reaming large cylindrical bushings or sleeves on a lathe, it is almost impossible to remove the completed piece as there is no place to get a grip. This is especially true when the sleeve OD is a close fit in the fixture.

Next time you have this trouble, bend a piece of flat stock into the U-shape shown and turn up a small foot at the end of each leg. By squeezing this device you can compress it enough so that it will pass through the bore of the workpiece. When it is released the feet will snap out to hook on the back edge of the part and the piece can readily be slid out. *Roger Isetts, Kenosha, Wisc*





Tool Aligns Miller Spindle for Boring Oversize Parts

To bore accurately aligned holes in castings which were larger than the milling machine capacity could accommodate, it was necessary to have the cutter spindle axis parallel to the machine ways, rather than parallel to the table. Setting the spindle with the solid steel square did not always provide this condition, as alignment was from the table surface rather than from the machine ways.

We built the device shown as a means of achieving this parallelism. To use the tool it is only necessary to mount a ¾-in. dia rod in the spindle of sufficient length to equal the table travel. This rod need only run true within 1/16 in., which is half of the difference between the OD on part "A" and the ID on part "B". One of the units is slipped onto the ¾-in. shaft close to the collet or chuck; the other unit is left at the opposite end of the shaft.

As the spindle is rotated, part "B" is tapped until it runs dead true with the spindle on both units. With both units true, an indicator mounted on a surface gage is placed on the milling machine table. By moving the table only, "B" is indicated. If the reading is identical on both units, the spindle is parallel to the specific ways being tested; if not parallel, correction is made.

This device will show at once whether a lathe will bore a truly straight hole in a chucked piece. The setup is simliar to that above, with the ¾-in. bar colleted in the spindle. After parts "B" are made to run true with the spindle an indicator is mounted in the toolpost and "B" is checked vertically and horizontally, showing any runout. *A J Rasys, Southbridge, Mass*

Air Jet Solves Chip Problem

In boring small cored holes in brass nozzles, the finished bore is very little larger than the boring bar and chip clearance is practically nil. To overcome this condition, I rigged an air jet to throw a blast of air through the hollow lathe-spindle.

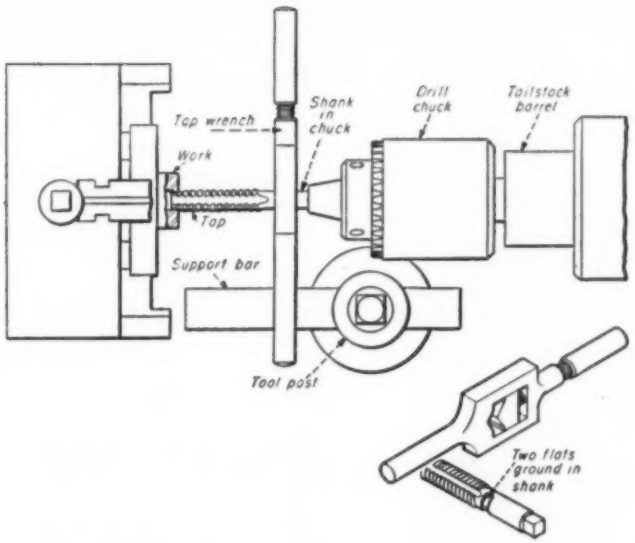
In addition to clearing the fine boring chips, I find that the workpiece temperature is kept lower and have been using it for this purpose even when no chip problem exists. If necessary, a baffle can be placed at the tool end of the work to prevent chips from flying out.

The jet assembly consists of copper tube fittings on a pivoted arm, held in place with a thumbscrew. For long bar work the unit can be swung out of the way. *Raymond G Hawkins, Oakdale, Calif*

Simple Center Adapter

Where much work is turned between centers, the headstock center will run out a thousandth or two when it is replaced after another holding method has been used. If turned true each time this happens, the center will soon be too short.

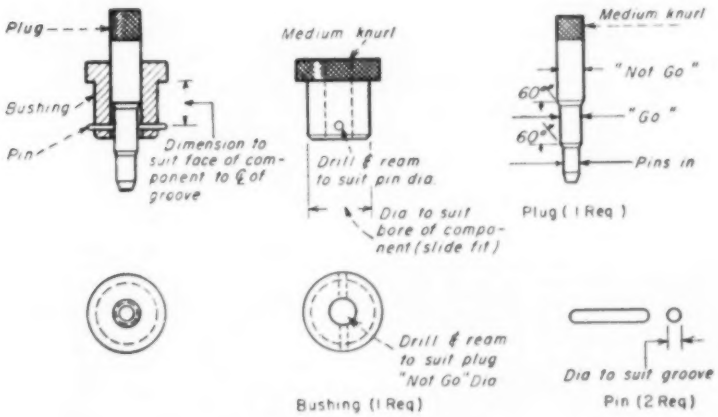
To overcome this condition, a taper insert is made to contain a piece of drillrod, slip-fitted and setscrewed in place. As the center is shortened, it is pulled out of the adapter. *D A McNaughton, Knoxville, Tenn*



Modified Tap Shank Eases Lathe Threading

In general lathe work, it is common practice to engage the tailstock center in the center hole in the end of the tap shank, fit a wrench on the square of the shank, and then follow the tap with the center as it cuts its way into the work. If the center leaves the center hole in the shank for an instant, the unequal strain thrown on the tap will usually break it. The use of small taps in the lathe is frequently precluded entirely as they are not provided with centers in the shanks.

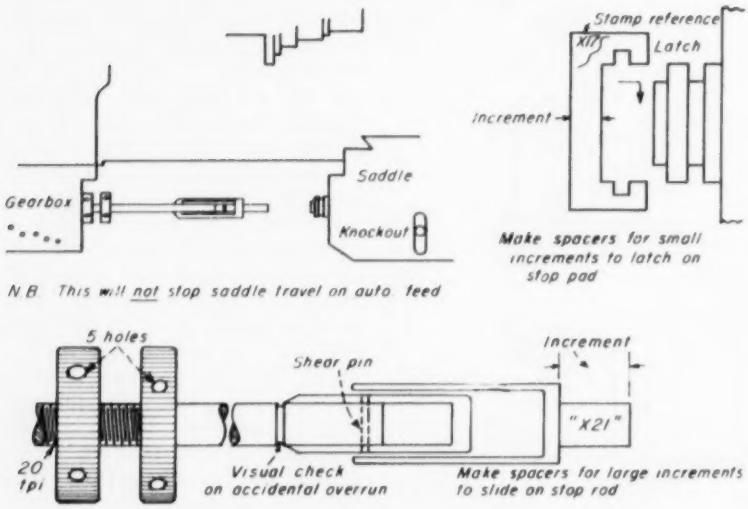
To overcome the danger of breakage, as well as permit the use of uncentered taps, a pair of flats is ground in to the tap shank at right angles to each other and close to the end of the thread. These flats will accommodate a standard tap wrench and the rest of the shank can be gripped in the jaws of the tailstock drill-chuck. The tap is kept from turning under the action of the rotating work by allowing one end of the tap wrench to bear on a support bar gripped in the lathe toolpost. Grip of the chuck jaws on the tap shank should be light so that if the feeding of the tailstock barrel is stopped while the tap is cutting, the tap shank can slide within the chuck jaws. *Clifford T Bower, London, England*



Gage Checks Snap-Ring Groove

To check the diameter of snap-ring grooves in components we were machining, I made the gage shown. Dimensions have been omitted from the sketch as the principle can be used to gage any groove diameter. The gage is made from toolsteel and is hardened before grinding to size. It consists of one plug, one locating bushing, and two pins. The two pins are inserted into opposite holes in the bushing which are just in line with the centerline of the groove; the pins having a sliding fit in the holes. The plug is provided with three diameters: "Pins in," "GO," and "NOT GO." The plug is started into the bushing, the pins are pressed (with the fingers) against the smallest plug diameter and then the bushing is inserted into the work and the plug pushed through. It should enter to the middle diameter, but not to the largest one.

The plug and pins should be oiled occasionally, to permit free sliding and to help keep the pins from falling out as the bushing is inserted. *W I Morgan, Somerset, England*



Length Stop Speeds Engine Lathe Output

When we had to make batches of multi-shouldered workpieces in which the shoulder spacing had to be held to close limits, we rigged a permanent stop on the lathe. Only two tapped holes were necessary, one in the gearbox and one in the carriage. The stop can be removed in a few minutes.

Select a position on the carriage side of the gearbox directly opposite a flat face on the saddle. Drill a ⅜-in. or ½-in. dia hole and tap 20 tpi (if possible) or a standard thread. According to the job, find the position the shouldering tool will occupy closest to the chuck, cut off a piece of rod about this length and thread it on one end to suit the tapped hole and 2-in. long.

Make two thick knurled washers and thread them accurately to fit the rod. Divide the washer rims to drill 5 equidistant holes for a handlebar. When adjusting the bar these holes serve as visual indications of 0.010 in., if a 20 tpi thread is used. At least try to use a thread that will divide into some positive increment. Make a safety sleeve to fit the bar end by drilling a slice of larger diameter bar to provide a sliding fit on the adjusting bar and fix it in position with a shear-pin. Shoulder this sleeve as shown to give a visible indication if the saddle is allowed overrun the stop.

Mark Location

With the stop in place, mark its position relative to the contact face on the saddle and drill and tap a hole in the saddle to take the contact pad, which is made as shown. If the workpiece shoulders are closely spaced, make spacers to fit the contact pad, but for widely spaced shoulders make the spacers to fit the stop-rod. These spacers can be easily made and can be measured to close limits. Gage blocks can be used as spacers if accuracy or speed demand it. If the contact pad is brought firmly into contact with the stop-rod when cutting the shoulder nearest to the chuck, every other shoulder will be in exact relationship to it, if the spacers are used in order. To avoid errors, the spacers should be clearly marked to indicate their size and sequence numbers. *Ian J Peacock, Cumberland, England*

Winner No. 167

of

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in

November 24, 1952

is

B E Long, Jr

Knoxville, Tenn

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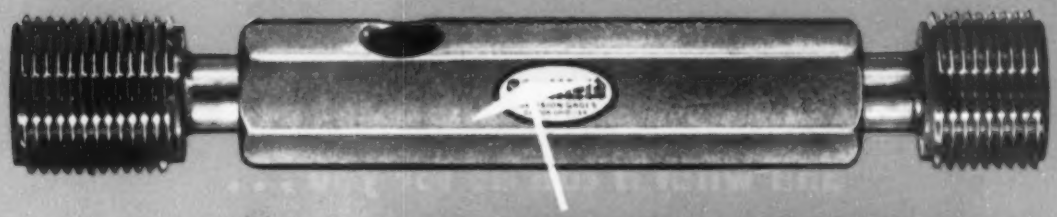
PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

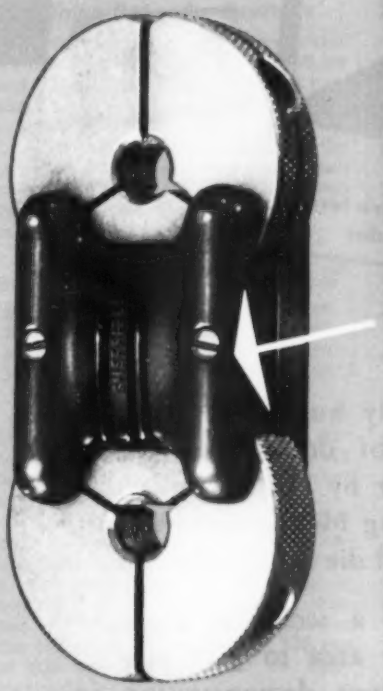
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N.Y.



SHEFFIELD THREAD GAGES

NEW PRICES STOCK DELIVERIES



The magnitude of current defense procurement pyramided on unprecedented civilian needs has made it practicable for Sheffield to more than triple its manufacturing facilities for standard thread gages . . . and to put them on a mass production basis.

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METAL DISINTEGRATION

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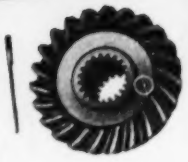
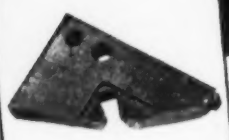
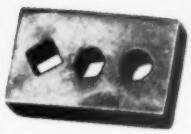


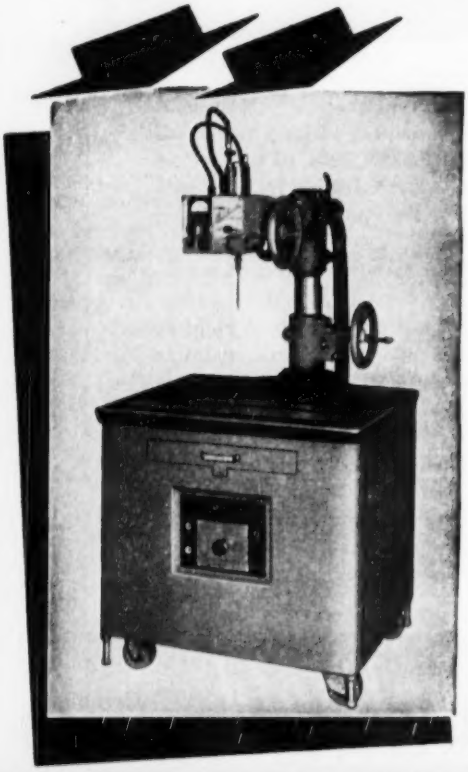
Cut oil holes in hardened gears without annealing



Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



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Machinability of Cast Steels...IV

Machining-Data Applications

Accompanying charts show cubic inches of metal removed (at 0.010 ipr and 0.100 in. depth of cut). Most production cuts involve depths of 0.100 to 0.150 in. at 0.010 ipr.

Let us see what tool life can be obtained at 0.015 in. wearland, when cuting 8630 with 78 B carbide, and the part requires removal of 5 cu. in. per pc.

SPEED	DEPTH OF CUT	TOOL LIFE CU IN	PCS PER GRIND
300	0.100	200	40
300	0.150	300	60
500	0.100	100	20
500	0.150	150	30

If the wearland is extended to 0.030 in., as in roughing where size control is not important, it should be possible to double the number of pieces per tool grind.

There is another aspect to this matter—production rate. See cutting-time charts to be published in a following number. Allowing a wearland of 0.030 in. and ½ min. per pc for loading and unloading, the situation for producing 120 pcs at 300 and 500 fpm can be summarized:

SPEED	TOTAL TIME MIN.	TOOL CHANGE AT
300	180	3 hr (every 120 pc)
500	120	1 hr (every 60 pc)

At 500 fpm, the production rate is 50% higher than at 300 fpm, at a sacrifice of two tool changes. Therefore, the problem is to balance productivity and tool cost.

Power Requirements

Estimates of power requirements, when scheduling work to machines, are made by these steps:

1. Determine rate of metal removal—cutting speed in inches per minute x ipr x depth of cut.
2. Select unit power requirement from Table II.
3. Multiply unit power by rate of metal removal, to obtain horsepower with sharp tool.
4. Power requirement rises as the tool dulls. Machine efficiency = 80%. Power to pull dull tool may be 40% to 50% greater than for sharp tool. However, combine the power increase for machine drive and dullness into one factor, say 50%. Therefore multiply power for sharp tool by 1½ to get safe motor rating.

TABLE II ... POWER REQUIREMENTS FOR MACHINING CAST STEELS

CAST STEEL	SPEED, FPM CARBIDE	SPEED, FPM HIGH SPEED STEEL	STRUCTURE	BHN	HP CU IN./MIN CARBIDE 78B	HP CU IN./MIN HIGH SPEEDS STEEL
1020	200-500	50-100	Annealed	122	0.89	0.82
	300-800	50-100	Normalized	134	0.90	0.82
1040	200-500	50-100	Annealed	175	0.77	0.84
	200-500	50-100	Normalized	190	0.74	0.82
	300-500-800	50-100	Double Normalized	185	0.87	0.94
	300-800	50-100	Normalized and Quenched	225	0.78	0.93
1300	200-500	50-100	Normalized	187	0.83	0.79
	200-500	50-100	Normalized and Tempered	160	0.92	0.89
4130	300-800	50-100	Annealed	175	0.82	0.90
	300-800	50-100	Normalized and Spheroidized	175	0.86	1.02
4340	200-500	50-100	Annealed	200	0.81	0.87
	300-900	50-100	Normalized and Spheroidized	210	0.80	0.93
	200-500	50-100	Quenched and Tempered	300	0.87	1.00
	200-500	50-100	Quenched and Tempered	400	0.90	1.07
8430	300-800	50-100	Normalized and Tempered 1275° F	180	0.76	0.98
	300-800	50-100	Normalized and Tempered 1200° F	200	0.71	0.88
8630	300-800	50-100	Annealed	175	0.76	0.88
	300-800	50-100	Normalized	240	0.85	0.89

Machinability Index

The machinability index of a material enables one to ascertain the relative machining characteristics of steels having various conditions of heat treatment. Conventional index numbers: for carbide—values based on short-time tests at 300 fpm and extrapolated to 2 to 3 hr; and with an index number of 10 assigned to 1020 (an index of 4 represents 40% as much metal removed per grind); for HSS—index numbers based upon 100 for machining standard wrought steel (B1112) at 180 fpm and tool life of 2 to 3 hr. Metcut index numbers are based on the cutting speed that will give one-hour tool life.

MACHINABILITY INDEX FOR CAST STEELS

STEEL	BHN	CONVENTIONAL CARBIDE	CONVENTIONAL HSS	METCUT HSS	METCUT CARBIDE
B1112 Free machining steel (wrought)	179	—	100	—	—
1020 Annealed	122	10	90	160	400
1020 Normalized	134	6	75	135	230
1040 Double Normalized	185	11	70	130	400
1040 Normalized and Annealed	175	10	75	135	380
1040 Normalized	190	6	65	120	325
1040 Normalized and Oil Quenched	225	6	45	80	310
1330 Normalized	187	2	40	75	140
1330 Normalized and Tempered	160	3	65	120	230
4130 Annealed	175	4	55	95	260
4130 Normalized and Spheroidized	175	3	50	90	200
4340 Normalized and Annealed	200	3	35	60	210
4340 Normalized and Spheroidized	210	6	55	95	290
4340 Quenched and Tempered	300	2	25	45	200
4340 Quenched and Tempered	400	5½	20	35	180
8430 Normalized and Tempered @ 1200°F	200	3	50	90	260
8430 Normalized and Tempered @ 1275°F	180	4	60	110	340
8630 Normalized	240	2	40	75	190
8630 Annealed	175	5	65	120	290

(To be continued)

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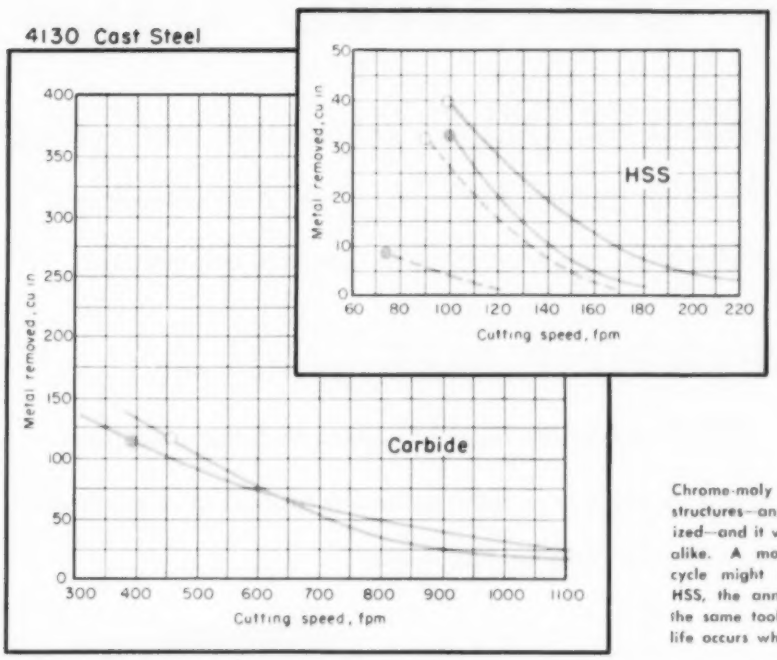
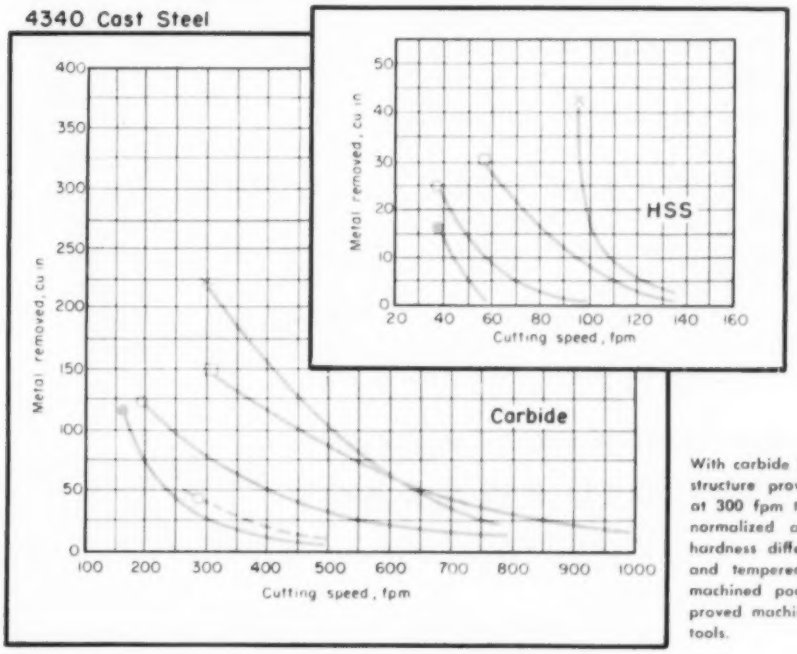
Machinability of Cast Steels...V



HARDNESSES:
Annealed—175
Normalized & spheroidized—175

○ Annealed
● Normalized and spheroidized
—— Base metal
- - - Casting skin

Chrome-moly cast steel (4130) was tested in two structures—annealed, and normalized and spheroidized—and it was found that they machine practically alike. A more complex and costly spheroidizing cycle might improve cutting characteristics. With HSS, the annealed form machines 10% faster for the same tool life. A considerable drop-off in tool life occurs when cutting the skin of the casting



HARDNESSES:
Normalized & annealed—200
Normalized & spheroidized—210
Quenched & tempered—300
Quenched & tempered—300

□ Normalized and annealed
× Normalized and spheroidized
○ Quenched and tempered 300 BHN
● Quenched and tempered 400 BHN

With carbide tools, the normalized and spheroidized structure provides a tool life about 65% greater at 300 fpm than that of the next best structure—normalized and annealed—although there is a hardness differential of only 10 points. Quenched and tempered forms, whether 300 or 400 BHN, machined poorly. A spheroidizing cycle also improved machining characteristics of 4340 with HSS tools.

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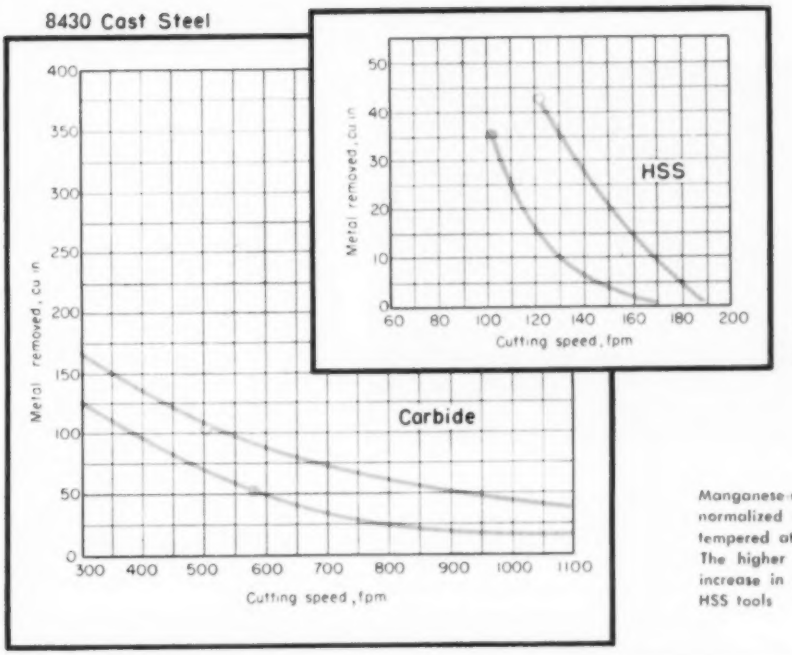
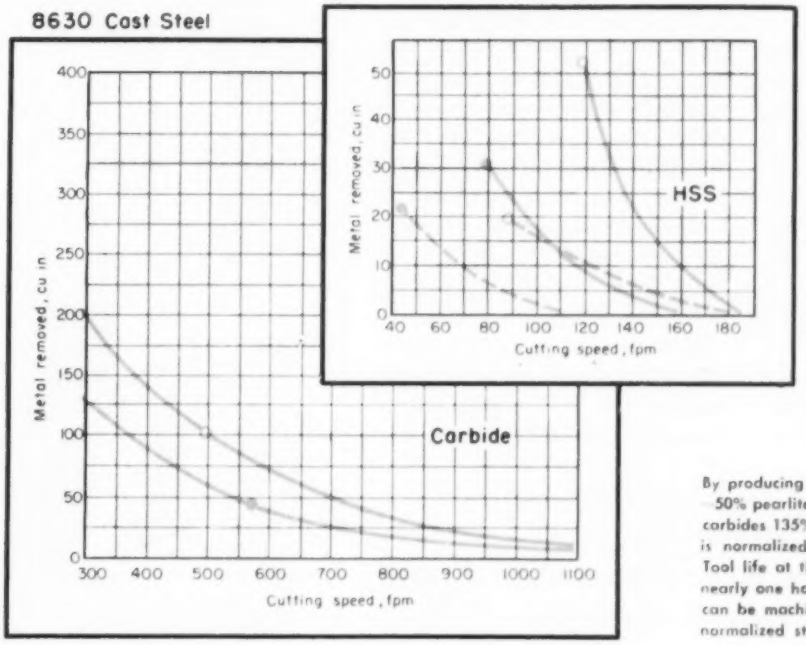
Machinability of Cast Steels...VI



Manganese-moly cast steel (8430) was tested in the normalized condition, but part of the bars were tempered at 1200 F and the remainder at 1275 F. The higher temperature treatment allowed a 25% increase in cutting speed for carbide, and 35% for HSS tools



By producing an annealed structure with 50% ferrite—50% pearlite, 8630 cast steel can be machined with carbides 135% faster at 300 fpm than if the material is normalized to an 80% Widmanstatten structure. Tool life at this speed is increased from 26 min. to nearly one hour. With HSS tools, the annealed steel can be machined at a speed 65% greater than the normalized steel

Production News

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TALKING SHOP

Awakening

A FRIEND OF OURS who makes lubricating devices says 1952 will be marked up as the year of the great awakening—because more lubrication equipment was bought by industry and more types of machines and equipment were switched over to centralized or automatic lubrication than in any previous year. Many more machine tools have centralized systems—because users want them, and many more automatic systems were put in for central service to machine groups.

Tanned Iron

BRITISH SCIENTISTS are discussing the possibility that tannic acid, applied to new iron, should provide exceptional protection against corrosion in such service as underground gas and water pipes. Their discussion is based on the fact that some 2,000-year-old nails and iron implements, unearthed in Yorkshire, were unusually well preserved. The pieces were lying in soil soaked with tannic acid oozing from old leather cuttings lying next to the metal.

Fertilizer Finish

E F SPICER, general foreman of the Power Transformer Tank Shop, GE-Pittsfield, is a "gun nut"—a collector of firearms. While looking over a formula for a gun-bluing mixture one night, he suddenly realized that it was quite close to that of some of the commercial fertilizers. He tried it; it worked, and he has since used it a number of times and has found that other gun nuts use it too.

Bluing is of course a rust-preventing process for steel surfaces, similar to many commercial processes for finishing. For this one, says Mr Spicer, you get high-concentration (18 to 20%) potassium nitrate or sodium-nitrate fertilizer, mix equal parts of it, commercial lye, and water, and heat the mixture until it boils. Boiling point should be in the range of 280 to 315 F. At the lower boiling point, steel parts will take a gray coating; at the higher, the coat is likely to be red. But somewhere in between, the coat will be a glossy blue-black. The trick is to raise or lower the boiling point as necessary, adding more water to lower it, allowing some water to boil off to raise it.

After parts have been colored as desired, they are flushed off with water, the hotter the better, then dried and rubbed with oil. The coating has some affinity for oil, and the latter adds to rust resistance and increases luster. The ultimate effect is like the finish on a gun barrel or a good twist drill.

Deep Bite

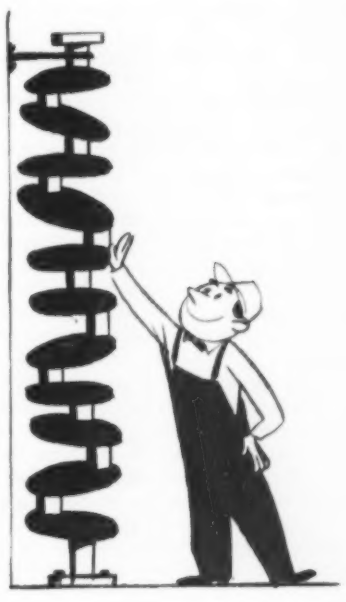
WE HAVE SEEN recently, in several shops, instrument castings odd enough in shape to be ungainly. These must have ends bored, faced, and tapped or threaded. Made in small quantities, they are logical lathe jobs, if a holding device can be developed. One builder uses a lever chuck he devised himself. Arms extending from the face of a universal chuck have levers pivoted near their outer ends. The inner ends of the levers are secured to the regular chuck jaws, the outer ends carry gripping pads. Thus the casting can be held and steadied at a considerable distance from the chuck face. The only peculiarity is that, to tighten the lever arms, the jaws must be opened.

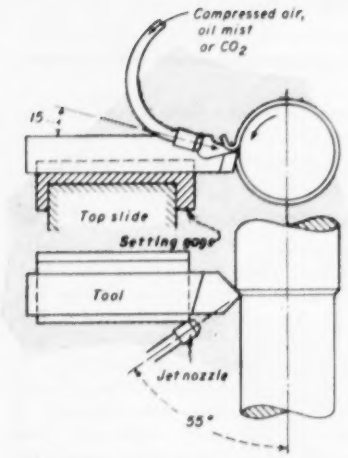
Busy Tool Room

CATERPILLAR TRACTOR has recently released some interesting statistics. In 1952, the toolroom at Peoria, Ill., finished more than 16,000 tool orders —an average of 350 a week, and ranging in production time from 30 min. to several months. On its staff are two full-time watchmakers to keep instruments such as stop watches and indicators in repair; the tool room has the highest percentage of veteran employees in the company.

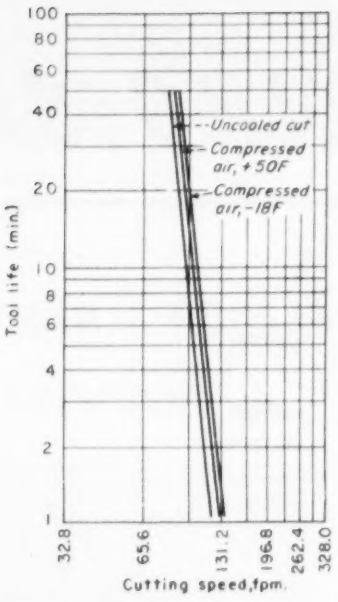
Vertical Saves 80%

TO STORE big crankshafts for diesels and gas engines as economically as possible, Cooper-Bessemer Corp, Mount Vernon, O, has built vertical racks along a line of columns at one side of the warehouse. Some 1500 sq ft of storage space has thus been shrunk to 300. Shafts are bolted to a flange plate in the floor and tied to a platform about 8 ft up with simple clamps. Crankshafts from 8 to 17 ft long and weighing 1000 to 6000 lb are stored thus without distortion.

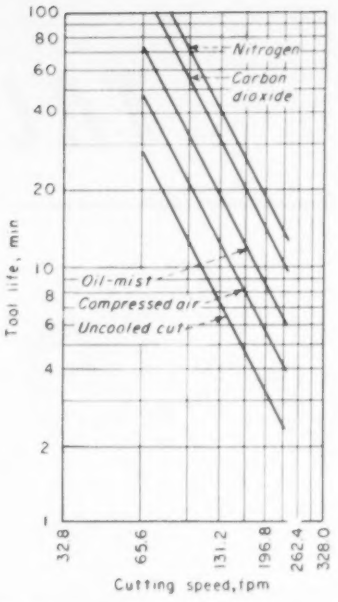




Setup for test with gaseous coolants. Best results were obtained with jet inclined 15° from horizontal and perpendicular to the cutting edge



2 Refrigerated compressed air at 18 F gave about 40% improvement in tool life over compressed air at room temperature. Improvement over uncooled cutting was 85 and 160% respectively. Material was 77,000-lb-tensile steel. Chip cross-section, 0.0005 sq in.



3 Comparison between various gases. Nitrogen supplied at 3.6 cu ft per min, at 68 F; CO_2 at 2.19 cu ft per min, at 41 F; air at 35 cu ft per min, at 68 F. All pressures at 29 psi. Chip cross-section 0.0015 sq in. HSS tool on 77,000-lb-tensile steel

Gases are good cutting coolants

BY PROF DR-ING G PAHLITZSCH, TECHNISCHE HOCHSCHULE, BRUNSWICK, GERMANY

Gaseous coolants are not a new idea. Compressed air, for example, has long been an obvious choice, and the use of CO_2 was actually suggested more than 30 years ago. Recent difficulties in machining some of the new alloys have led to the application of this (AM-Mar 3 '52, p129)

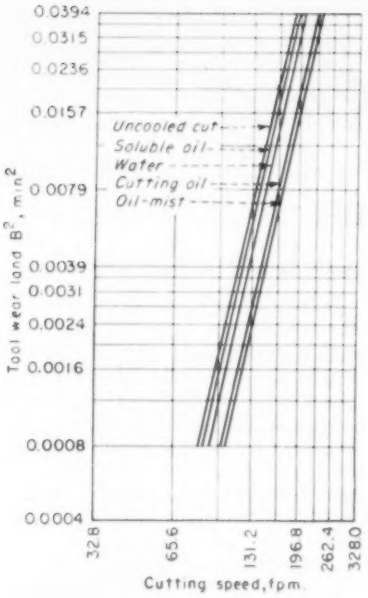
Disadvantages to be overcome with gases are their low specific heat and heat conductivity, the general absence of lubricating qualities, the disturbing noise when high pressures are used, and the danger of blowing chips and abrasive particles into slideways, bearings, and spindles. On the other hand, both machine and work remain dry, and coolant pump and plumbing are not required.

Poor heat-conducting properties of compressed air can be offset by refrigerating it to produce a greater temperature difference between the tool point and the incoming air. Equipment for this is already available and operates with a mixture of solid CO_2 and alcohol. Temperature of the chilled air is estimated to be between –40 and –76 F, and tests with this on a profile-milling operation, using an end mill, are said to have increased tool life 400%.

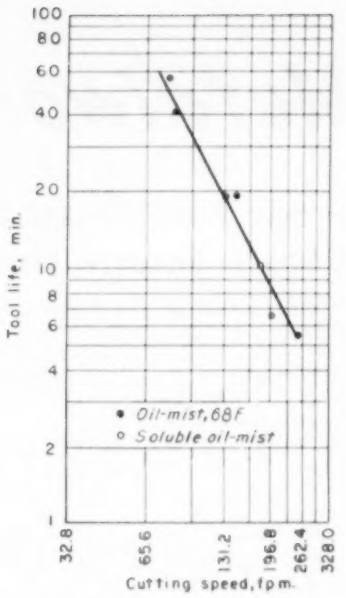
Similar experiments with turning were made at Brunswick. Some difficulty was experienced because the refrigerating coil iced up, but this was overcome by installing a silica cartridge in the circuit to dry the air. Temperature of the air leaving the jet was only –18 F. Orifice diameter was 0.079 in., giving a flow of approximately 4.25 cu ft per min at a pressure of 29 psi. Tool was unalloyed tool steel. Earlier experiments had shown that the air pressure, within a range of 15 to 75 psi, has no appreciable effect on cutting temperature.

Results of this test are shown in Fig 2, and it will be noticed that the increase in tool life is smaller than that obtained on the milling test reported. Measurements have shown that the temperature rise of the air at 0.59 in. from the nozzle is about 30 F. But, in turning, chips prevent the nozzle from being closer to the tool point than about ¾ to 1 in., so the temperature at the point was only around freezing. In end milling, it is possible to get the nozzle much closer to the cutting edge, and this may partly explain the difference.

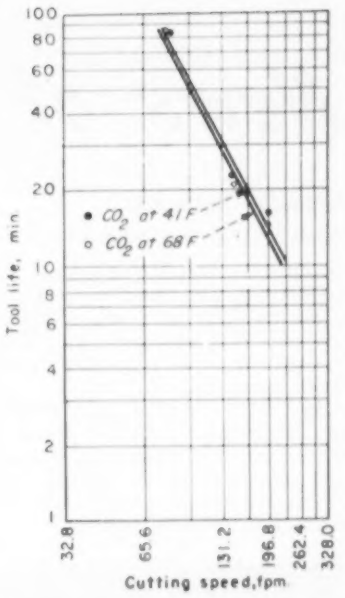
In general, however, the use of supercooled compressed air as a cooling medium for machining seems rather unsuitable in view of the expense involved in refrigerating and drying it. Another disadvantage is the complete lack of lubricity. To overcome this, a further series of experiments was performed, in which vaporized oil was mixed with the compressed air by means of an injector. The amount of oil was only 0.007 oz per min for an air flow of 3.5 cu ft per min, using a 0.079-in jet dia. Results were surprisingly favorable, as shown in Fig. 3, based on a wear land B of 0.004 in. For these, and all subsequent tests, HSS tools were employed. It can be seen that the gain in tool life, using pure compressed air, is about 70% over uncooled cutting. With oil mist, the gain is increased to about 150%. A comparison of



4 Tool wear with carbon steel tools on 77,000-lb-tensile steel with chip cross-section of 0.00015 sq in., and a turning length of 130 ft. Soluble oil mix 1 to 15; water with 0.5% calcium chromate; and cutting oil supplied at ½ gpm. Oil mist 0.009 oz per min, air 4¼ cu ft per min



5 Vaporized soluble oil, 1 to 10 gave as good results as vaporized mineral oil. Oil mist supplied at 68 F, 0.007 oz per min oil, 3½ cu ft per min air. Soluble oil mist at 64 F, 0.007 oz per min oil, 3½ cu ft per min air. Pressure 29 psi. Orifice 0.079 in. in both cases



6 Temperature of CO_2 has little effect on tool life. In both cases pressure was 29 psi through 0.079-in. orifice at 2.19 cu ft per min. Chip cross-section was 0.0015 sq in. HSS tool on 75,000-lb-tensile steel. Action on edge may be chemical or molecular-physical

oil mist cooling with compressed-air cooling shows that oil dispersed in the air at 0.007 oz per min results in a tool life improvement of about 50%.

BETTER THAN OIL STREAM

From an earlier series of experiments with unalloyed tool steel, in which liquid cutting oil was applied in a stream at ½ gpm, it was found that oil-mist cooling is even superior to oil-stream cooling, as shown in Fig. 4. This may be because mist has better access to the tool and cutting area, and to the sliding surface of the chip lamina, than has a solid stream, because of the latter's higher viscosity. Further experiments are being conducted to clarify this phenomenon.

As shown in Fig. 5, soluble oil gave the same results as mineral oil. The comparatively small fat content of the emulsion is apparently sufficient to give the required lubricating effect. This is important, because vaporized soluble oil is not objectionable to the operator as is vaporized mineral oil, although an exhaust system could be installed to remove the mist.

CO_2 IMPROVES CUTTING ACTION

Another series of tests was carried out with CO_2 supplied from tanks at 570 psi. Despite the drop in temperature which takes place on expansion, the CO_2 remains in gaseous form. Depending on the amount of gas in the tank, exit temperature at the nozzle was between 37 and 45 F. An appreciable improvement in cutting action could be seen from the easy chip formation and the absence of temper color. This is shown clearly in Fig. 3. Compared with compressed air, tool life increased about 140%, and was about 60% greater than with oil mist. Compared with uncooled cutting, CO_2 gives a tool-life increase of about 300%.

To determine whether the improvement was caused by temperature differentials, other experiments were performed with the CO_2 brought to room temperature by preliminary expansion in an intermediate container. Fig. 6 shows that the effect of CO_2 is independent of the temperature difference. As increased tool life also occurs at room temperature, it must result from other influences (probably of molecular-physical or chemical nature). It is possible that the CO_2 atmosphere prevents oxidation on the cutting edge, and it may influence the frictional conditions or affect the separation of the molecules. In any case, the effect is considerable and is worthy of further analysis by a series of tests.

TESTS WITH NITROGEN

If the assumption is correct that frictional oxidation is inhibited, a similar phenomenon should occur with other neutral or reducing gases. A corresponding series of tests was made with nitrogen, and they confirmed the assumption; in fact, they even showed an improved effect over the tool life with CO_2. Tool life was about 30% higher than with CO_2, or about 450% better than with uncooled cutting. This foreshadows the use of still other gases.

In selecting a gas, consideration must be given to operator health. CO_2, therefore, does not seem particularly suitable because of the danger to personnel, particularly in winter when ventilation is not too good. Nitrogen seems to be much more suitable in this regard.

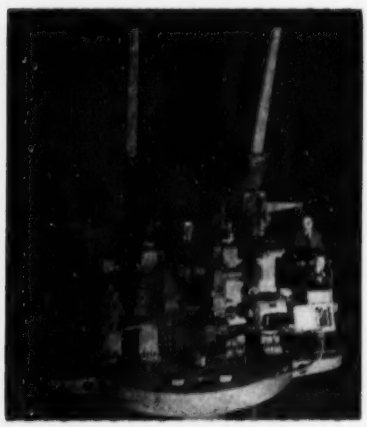
The question of cost must also be considered. With CO_2 or nitrogen, the amount was about 4.5 oz per min, so it is possible that the use of these gases may be economical only in special cases. There are, however, reasons to hope that the amount of gas can be reduced considerably without loss of effectiveness. Meanwhile, new experiments are being made with gas-cooled carbide tools.

This report was originally published in Industrie-Anzeiger. Verlag W Girardet, Essen.

News of Metalworking

FORD TO BUILD WEST COAST ASSEMBLY PLANT

DETROIT—Ford Motor Co has announced it will build an assembly plant for Ford cars and trucks in the San Francisco area. The plant is expected to be completed within three years and will cost an estimated $35-50 million. Ford's existing West Coast assembly plants at Richmond and Long Beach, Calif, will remain operation "at least until the new facilities are occupied," according to company officials.



NEW 3-IN. ACK-ACK GUN now comming off Firestone production lines is operated by chairman Harvey S Firestone, Jr, (left), and vice presidents J E Trainer (center) and R C Firestone. Equipped with automatic loading and radar fire control, gun will fire 3-in. shells at either low or high flying aircraft

NINETEEN SOCIETIES AID WESTERN METALS SHOW

LOS ANGELES—Western sections of 19 national technical societies will cooperate with American Society for Metals in putting on the Western Metal Exposition & Congress here March 23-27. Programs will be presented by ASM, SAE, AIMME-Metals Section, AWS, American Foundrymen's Society and Society for Non-Destructive Testing. Among other cooperating organizations are: ASME, ASTE, ASTM, American Ordnance Assn and Institute of Aeronautical Sciences.

Some 300 firms are expected to exhibit latest developments in metalworking equipment.

Frear Tax-Writeoff Bill Before Senate Finance Committee

WASHINGTON—A bill that would allow taxpayers to write their own timetables for taking depreciation allowances on real and personal property has been introduced in Congress by Sen Frear (D, Del).

The bill has been referred to the Senate Finance Committee and is awaiting House action on a companion measure.

Sen Frear's bill would let taxpayers write off real property depreciation in as little as five or as much as 50 years; personal property in one to five years. Once the length of time is decided on by the taxpayer, the decision is binding and can only be changed with Treasury approval.

- **For instance:** if a manufacturer wants to write off the cost of a heavy machine in one year, he can do so. In effect, this means he will list it as a business expense rather than a capital asset. But once he has taken the full value, he forfeits listing the machine as a tax deduction.
- **The benefits:** simplified bookkeeping and negotiations with the Treasury; accelerated tax write-offs effected by the bill would stimulate industry demands for new equipment.

CIO Attitude on Free Enterprise Shown in 3000-Page Survey

CLEVELAND—What does CIO think about free enterprise? The answer, in CIO's own words, is now available in a 3000-page report compiled by a Cleveland public relations firm at the request of William E Umstattd, president, Timken Roller Bearing Co, Canton, Ohio.

Two years ago, Mr Umstattd hired the firm of John Yezbak & Co, Cleveland, to scan every available bit of literature on the subject printed by CIO and its unions from its inception to 1952. Yezbak has been given permission to make the report available to anyone interested.

The $64 questions:

- Was the CIO created to destroy the free enterprise system?
- Does CIO plan to replace free enterprise with a labor-dominated regime?
- Are the communists out of CIO?

The answers: while the Timken survey makes no attempt to answer these questions, the report does show a surprising coincidence of attitudes between CIO official publications and communist papers. Where atttitude toward free enterprise is involved, CIO follows the communist party line with the persistence of a shadow.

To gather evidence of CIO's attitude, Yezbak and his staff spent two years haunting libraries, reading every scrap of CIO news in metropolitan dailies and union newspapers, comparing their findings with attitudes expressed by the communist Daily Worker.

LARGEST STEAM DROP HAMMER? Erie Foundry Co, Erie, Pa, builder of this 50,000-lb hammer, believes it to be the heaviest of its type in the world. Built for the Air Force program, the hammer without dies weighs 800 tons, but is easily controlled by one operator. Counterbalanced distribution valve permits sensitive control.

CMP to Die June 30: Merge Top Civilian Mobilization Agencies

WASHINGTON — The controversial Controlled Materials Plan will get the axe June 30, by executive order of President Eisenhower.

The order came hard on the heels of the President's deathblow to controls, announced in his "State of the Union" message, and was followed by an order to merge the nation's top civilian mobilization agencies—Office of Defense Mobilization, National Security Resources Board, Defense Production Administration, and Economic Stabilization Agency.

National Production Authority, the Commerce Dept's materials allocating bureau, which carries out ODM-DPA policy, will stay on to run the Controlled Materials Plan until it expires June 30.

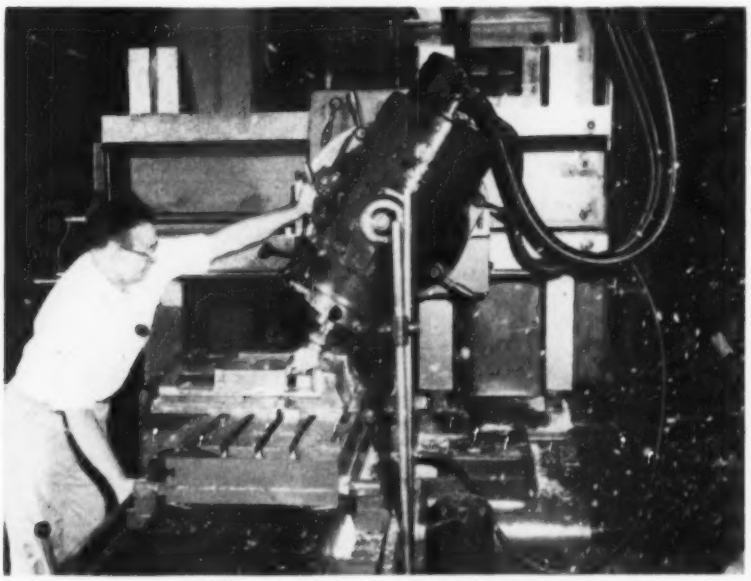
After CMP's demise, the President announced, there will still be some type of priority and allocation system, but it's still undecided how extensive the system will be or how it will work.

This much seems certain:

- Direct allocations to mills will remain on nickel, cobalt, tantalum, columbium, molybdenum and beryllium.
- Military and essential defense-supporting contractors and sub-contractors will be issued priorities for procurement of steel, copper, aluminum, critical metals.
- Non-military manufacturers will presumably be unaffected by the plan, except perhaps by a greater scarcity in steel shapes and forms, and copper. ODM is now drafting plans for post-Controlled Materials Plan allocation and priority system.

RHOADES HEADS ALUMINUM ASSOCIATION

NEW YORK—D A Rhoades of Kaiser Aluminum & Chemical Corp, Oakland, Calif, was elected president of the Aluminum Association at its annual meet here. Other officers: Vice presidents—S D Den Fyl, Bohn Aluminum & Brass Corp, Detroit; Raymond Deutsch, Monarch Aluminum Mfg Co, Cleveland; R P Stranahan, Stranahan Foil Co, South Hackensack, NJ.



UNUSUAL GERMAN THREAD ROLLER INSTALLED IN ENGLAND at Leyland Motors, Ltd, produces wheel studs in a single 9-sec operation. Machine forms threads on both ends, either both right hand, or one right and one left. Blanks are magazine fed and finished parts roll down chute to conveyor. Rolling pressure is 11 tons. Surface is equivalent to ground finish. Machine was built by Berlin's Pee-Wee Maschinen und Apparatebau

Metalworking Abroad

(By McGraw-Hill World News)

Break-even point on commercial jets may have to be revised, according to Britain's De Haviland Aircraft Co, maker of the world's first commercial jet airliner, the Comet. Originally, the company thought it would start making a profit after selling the first 50, but because of "uncertainty of some orders" the figure may have to be raised.

Austin cars will be assembled in Japan, under terms of an arrangement between Japan's Nissan Motor Co and Britain's Austin Motor Co whereby Nissan will import parts from Austin for assembly of 2,000 cars per year for three years. For the last four years of the seven-year contract, Nissan will pay 5% royalties on all cars assembled.

British office machines, manufactured by Power-Samas Accounting Machines, London, have been added to Underwood Corp's line. Under terms of a recent agreement, Underwood will have exclusive US distributorship of the British firm's punch card and equipment line.

Canadair, Ltd, now owns Fleet Mfg, Ltd, of Canada and will operate it as a branch plant for sub-contract work on F-86 Sabre Jets and T-33 Jet Trainers. Parts made at Fleet's Fort Erie, Ont, plant will be shipped to Canadair at Montreal for assembly.

Three Dutch factories have orders from the Netherlands Railways for 100 diesel-electric locomotives to be built according to American design. Technical assistance will be given by Westinghouse Corp, Baldwin-Lima-Hamilton Corp, and National Supply Co.

Japan expects $400 million US arms orders this year. Bulk of this will go for manufacture of mortar shells, rocket shells, small and medium calibre arms, while $100 million will be devoted to aircraft repair. US orders for manufacture of tanks, planes and naval craft are not expected to come through this year.

Britain exported $140 million in textile machinery last year, an all-time record. Chief buyers were: India, 19,672 tons; Brazil, 13,257 tons; Italy, 11,246 tons; and Pakistan, 10,274 tons.

CHATTANOOGA FIRM TO PRODUCE ALUMINUM

WASHINGTON — Defense Production Administration has completed its aluminum expansion program by approving The Wheland Co, Chattanooga, as its fourth new primary aluminum producer. The others: Anaconda Copper, Olin Industries, Harvey Machine Co.

Addition of Wheland as a primary producer will create an annual domestic aluminum capacity of 1.7 million tons by 1955—more than double pre-Korea output. Wheland's share will be 2.1%.

DPA has granted Wheland accelerated tax amortization for construction of a $70 million plant with an annual capacity of at least 50,000 tons. To be located near Chattanooga, the plant will be privately financed.

Distributors Named

Combustion Equipment Co, Chicago, has been named Chicago distributor for **Orr & Sembower** packaged automatic boilers. Combustion Equipment will handle sale of Powermaster automatic steam generators in northern and central Illinois, northern Indiana, southeastern Wisconsin territories.

Pivot Punch & Die Corp, North Tonawanda, N Y, has licensed **Slater & Crabtree, Ltd,** Wakefield, England, to manufacture and distribute its line of steel punches in Europe and Australia. Negotiations are currently underway by Pivot Punch to establish distributorships in principal South American metalworking centers.

Wood-Compton Co has been formed at 25010 Lakewood Blvd, Cleveland, to act as direct factory agent in northern Ohio and northwest Pennsylvania for several industrial power apparatus manufacturers: **Ultrasonic Corp., Warner Electric Brake & Clutch Co.,** and **Farmer's Engineering & Mfg Co.**

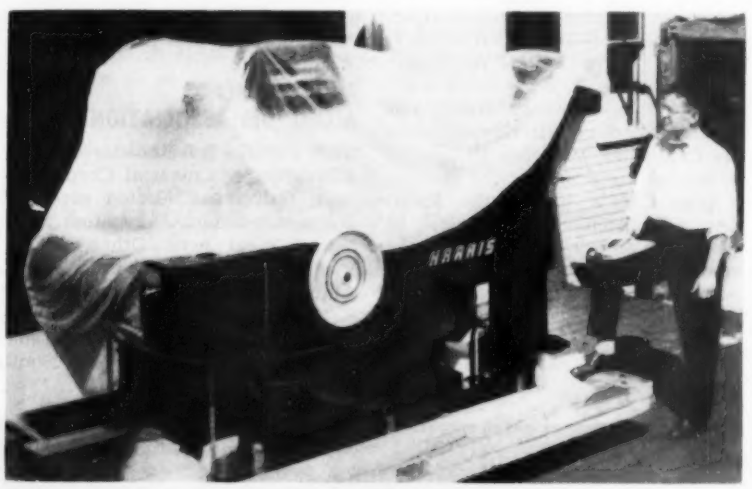
R M Maxwell and **P S Oliver** of **Industrial Castings & Forgings Co,** Pittsburgh, have been named exclusive sales representatives in western Pennsylvania, Ohio and West Virginia for **Henry Disston & Sons, Inc's** Steel Division.

Limit Output of US-Owned Auto Assembly Plants in Mexico

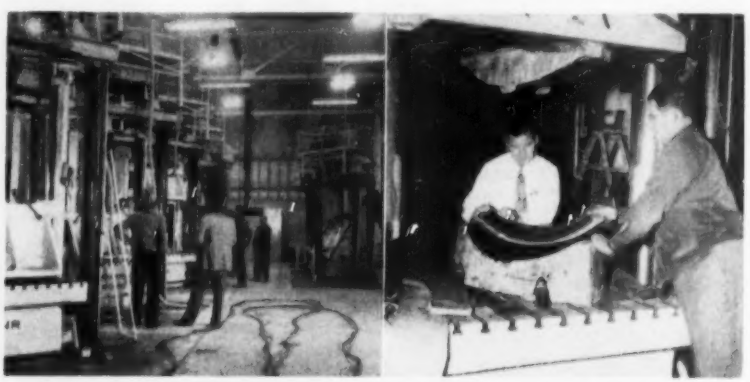
MEXICO CITY—Mexico's seven US-owned automobile assembly plants have been placed under production quotas by the Mexican government after a year of restriction-free production. Also limited by the order is production of Italian Fiats, assembled in a local metalworks.

Plants affected by the new restriction and their quotas are: General Motors (Cadillac, Buick, Oldsmobile, Pontiac, Chevrolet, GMC trucks, Opel) 9,000; Ford 8,500; Chrysler (Chrysler, DeSoto, Dodge, Austin Fargo trucks) 6,000; International Trucks 1,500; Willys-Overland 1,250; Nash and Studebaker (combined assembly plant) 1,200; Packard (Packard, Hillman-Minx, Mack Trucks) 700.

Smaller allotments were given to: Kaiser-Frazer, 275; Hudson, 200; Federal Trucks, 100; Diamond-T, 100. As yet not allocated by Mexico: 475.



PLASTIC SHIPPING COVERS FOR MACHINERY are used by Harris-Seybold Co, Cleveland, in shipping its small offset presses. The advantage: no need to coat bare metal surfaces with heavy grease as protection against rust, eliminating its laborious application and removal before installation



NEW ANGLE IN PLANT LAYOUT was devised recently by engineers of Rohr Aircraft Corp's Riverside, Calif, plant, where six Rohr-designed drop hammers were recently installed at 45 degree angles, resulting in a one-third saving in usable floor space. Right: factory manager Charles E Barnes, left, and drop hammer foreman Don Trimble inspect first stamping at the new plant, which produces the KC-97 aircraft power package

Miracle Miller Moves Metal At 10,700 rpm; 375 ipm

FORT WORTH, TEXAS — Capable of cutting a 4-in. furrow in a 48-in. aluminum bar in just 8 sec is a miller developed and manufactured by Cincinnati Milling Machine Co under US Air Force contract and installed here at the Convair plant for investigation and evaluation.

Designed specifically for machining the non-ferrous metals used in the aircraft industry, this miller is expected to be particularly valuable for working large forgings. Thus far, B G Reed, Asst Div Mgr for Convair, said that B-36 aircraft parts have been machined with finish and flatness not previously attained with conventional milling machines. Convair has been asked by the Air Force to develop the optimum cutter and fixture designs to be used with the mill. Monthly performance reports are submitted by Convair to the Air Materiel Command's Production and Resources Div.

Approximately the same size as conventional millers, the new machine is capable of much greater output as a result of its enormously increased rotational speed and its increased feed. As the intense heat generated by machining at this speed is transferred into the chip, rather than into the machine, workpiece warpage is avoided.

Machine's spindle has water-cooled bearings and mist lubrication; is designed to permit swiveling 45° on either side of the center of the cut. A motor-driven suction attachment, resembling a giant vacuum cleaner, sucks up the fast-flying chips and automatically loads them into mobile hoppers for carting to the plant's salvage area.

ORDNANCE PRODUCTION FILM AVAILABLE

CHICAGO—Clearing Machine Corp has just released a 16-mm sound-color movie on production of steel cartridge cases. Available without charge to technical groups and industrial firms, the film shows press operations at Rheem Mfg Co's New Orleans plant.

Press work necessary to transform a flat steel disc, 8⅞" in diameter and 0.690" thick into a streamlined cartridge case 24" long is shown. Featured is a new two-slide press.

"A Better Way to Manufacture Shell Cases" is available from Advertising Dept, Clearing Machine Corp, 6499 W 65th, Chicago 38.

TOMORROW'S MACHINE TOOLS may be foretold in this high-speed miller developed by Cincinnati Milling Machine Co for the Air Force. Machine has vertical head operating at 10,700 rpm over an 18 x 18-in. table that advances at 375 ipm, returns for reloading at 400 ipm

Plant Expansions

Swedish Gage Co and its division, **C E Johansson Gage Co,** have moved into a new 17,000 sq ft office and manufacturing building at 10641 Haggerty Ave, Dearborn, Mich.

Dalmo Victor Co, San Carlos, Calif, electronic equipment manufacturing firm, plans a 75 x 100 ft one-story plant addition to house a military equipment laboratory.

Skinner Chuck Co recently completed a new 85,000 sq ft plant at New Britain, Conn. The plant houses both Skinner Chuck Co and its Electric Valve Div, and is equipped with every modern facility for production of lathe chucks and machine vises for machine tools and solenoid valves. Also in the plant are company offices and experimental development laboratories.

General Motors' Saginaw Steering Gear Div is constructing a 500,000 sq ft plant near Saginaw, Mich, for producing power steering mechanisms. Some 1500 workers will be employed in the new plant, scheduled for Oct 1 completion.

F J Stokes Machine Co, Philadelphia, has completed a new laboratory for testing and development of materials, equipment and processes.

American Welding & Mfg Co, Warren, Ohio, is adding 25,000 sq ft of floor space to augment production facilities for jet aircraft components.

A Milne & Co, New York distributors of solid and tool steels, are adding a new warehouse at 753 Chestnut St, N W, Atlanta.

Harvey Machine Co, Torance, Calif, will build a $20 million aluminum rolling mill for production of sheet, strip and circular shapes, at a West Coast location to be named later.

Babcock & Wilcox Co will build a $2 million plant for production of boilers and boiler equipment south of Wilmington, N C. The new plant, employing some 750 men, will get into operation around the middle of June, and will mark doubling of B & W boiler output within a year.

Reynolds Metals Co has contracted with the Navy for a $7½ million addition to its McCook, Ill., plant. The addition will produce aluminum tapered sheet and plate for Naval aircraft manufacture.

INVITE US INDUSTRY TO STANDARDIZE TERMS

NEW YORK — US firms are being asked to participate in international unification of automatic-control process terminology, through the American Standards Assn.

Purpose of the proposal, made by Germany's national standards body, is to unify international terminology in all fields applicable to such terms — electronics, hydraulics, electrical control, etc.

Secondary purpose of the Germans is to avoid possible misunderstanding between users and producers regarding unity clauses.

CUTTING TOOL MANUFACTURERS ELECT

CHICAGO—Cutting Tool Manufacturers Assn, meeting here late in January, elected Gordon Birgbauer, president, Super Tool Co, Detroit, president. Other officers elected were: vice-president, Robert H Wolfe, Arrow Tool & Reamer Co, Detroit; treasurer, R S Spencer, Detroit Boring Bar Co, Detroit. New directors are: E A Goddard, Goddard & Goddard, Detroit; Emil Gairing, Gairing Tool Co, Detroit; Howard Devlieg, Devlieg Microbore Co, Pleasant Ridge, Mich; and Robert Murdock, Murdock Tool Co, Detroit.

CURTICE SUCCEEDS WILSON AT GM

NEW YORK — Harlow H Curtice was elected president of General Motors Corp at a board meeting here Feb 2. Mr Curtice succeeds Charles E Wilson, who resigned as president of GM upon his confirmation by the Senate as US Secretary of Defense. Philip J Monaghan was elected a vice president to succeed new Deputy Secretary of Defense Roger M Kyes.

ESTABLISH M.E. CHAIR AT CARNEGIE TECH

PITTSBURGH—A new mechanical engineering professorship has been established here at Carnegie Institute of Technology by the Aluminum Co of America. Holder of the new $15,000-a-year chair will be Dr Dennistoun Wood VerPlanck, head of Carnegie Institute of Technology's Mechanical Engineering Dept.

Steel Industry Expansion Mostly In Plant, Materials: Survey Shows

WASHINGTON — Almost three-fourths of the steel industry's post-Korea expansion has been in basic steel plant and raw materials facilities, with the balance going into finishing facilities. This is disclosed in the first phase of a Defense Production Administration-National Production Authority survey of potential US production of finished steel items needed in the event of full mobilization.

Survey shows that $4.6 billion in fast tax writeoffs certified to steel companies by DPA breaks down this way:

- **Basic steel and supporting facilities:** iron and iron ore processing, 20%; blast furnaces, 12.4%; steelmaking, 12.4%; semi-finishing 7.8%; other facilities (plant, transportation, materials) 20.3%.
- **Finishing facilities:** rails and accesories, 0.1%; bars 2.2%; shapes and piling 0.7%; plates 0.5%; pipes and tubing, 5.8%; rods, wire and wire products 0.9%; sheet, strip and black plate 15.3%; forgings 0.1%; tin products 1.5%.

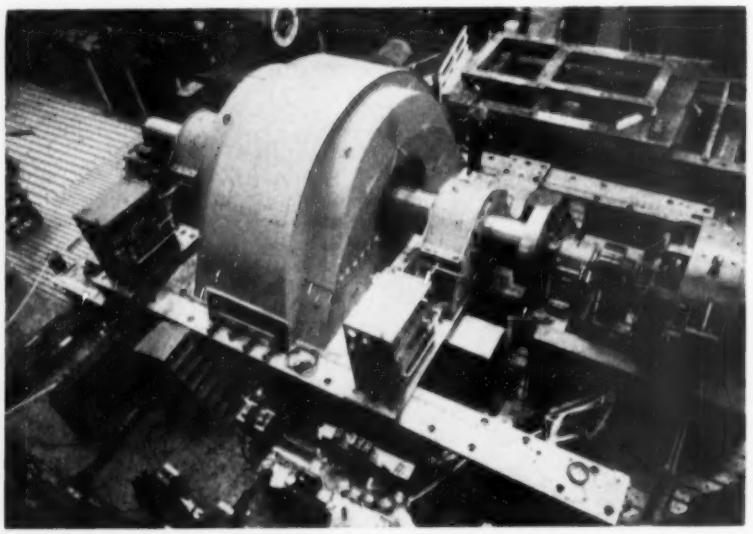
Hoffman Returns To Studebaker

NEW YORK — Paul G Hoffman, president of the Ford Foundation, will resign March 1 to return to his former position as chairman of Studebaker Corp, South Bend, Ind. The erstwhile Economic Cooperation Administration Chief will take over as chairman from Studebaker president and chairman Harold S Vance, who will continue to serve as president of the company.

NPA Has 34,000 Machine Tools on Hand

WASHINGTON — More than 34,000 government-owned idle or surplus machine tools are now available at National Production Authority, US Department of Commerce, Washington, DC, for lease to direct military and defense-supporting contractors hard-pressed to finish production because of tool shortages.

During the last nine months, 10,477 tools have been allocated and shipping instructions issued for 3,197, NPA states. Only about 25% of the tools are general-purpose, up-to-date tools. The remainder are special-purpose, obsolete or damaged.



WORLD'S MOST POWERFUL MOTOR, one of two being built by Westinghouse at East Pittsburgh for driving wind tunnels at the Air Force's Arnold Engineering Development Center, Tullahoma, Tenn, develops 83,000 hp. The two motors will be coupled with two 25,000 hp motors to develop a 216,000 hp drive

Develop 70,000 Psi Injection Press, Anti-Swing Crane at Argonne Lab

CHICAGO—Two offshoots of Atomic Energy Commission research—a pneumatic plastic injection-molding press capable of producing pressures up to 70,000 psi, and an anti-swing, anti-creep hoisting crane—have been developed here by Argonne National Laboratory engineers.

Press Costs Under $1000

The press differs radically from conventional hydraulic presses in control of operating pressures and temperatures. Its components cost less than $100 and can be assembled in under 250 hours.

Produces Optical Pieces

Used in producing optical pieces for atomic radiation exposure meters, the press is driven by an air cylinder and controlled by electric valves so arranged that injection speed is easily regulated. When pressure in the cylinder reaches a pre-set value, a throttle valve short-circuits automatically, causing air pressure in the cylinder to increase to the desired value. A pressure of 1 psi on the air cylinder exerts a pressure of 500 psi on the piston.

Unique Control System

Temperature control system is unique. Rigid control is accomplished by regulating temperature of the cylinder's upper part independently from the lower section, which consists principally of plastic spreader and nozzle.

Cylinder's lower section is of 0.010-in. stainless reinforced by heavy copper collars. Heat, supplied by electrical bands, is conducted through the collars and thin wall to the plastic. Thus, plastic enters the injection-chamber top, is converted to a liquid, heats as it moves downward, and enters the mold at the desired temperature.

Anti-Swing Crane

Now in the laboratory-scale-model stage at Argonne is an anti-swing crane with anti-creep variable-speed hoisting, capable of transporting radioactive or hot materials without need for workmen to guide the load. Pendulum-like swinging is cut to a minimum and vertical creeping is eliminated.

Servomechanism Controls

Normal carriage drive has been replaced with a servomechanism that moves the carriage in accordance with electrical signals. Here is how it operates:

Operator sets control knob for direction of travel. Crane, as it moves, transmits signals to servomechanism regarding its position, speed, and amount of load swing. Servomechanism totals these signals against those set by control knob. When sum of signals equals zero, load is in desired position.

An electrical signal indicates degree of load swing and causes slight movement of crane carriage in direction of swing, allowing the load to dissipate its oscillatory energy into carriage. Load stops swinging within one or two cycles.

Variable Speed Drive

Crane is also equipped with continuously variable-speed drive for hoisting operations, assuring smooth, accurate vertical load control. Feedback arrangement stops vertical movement, prevents creeping.

Interested firms are invited to avail themselves of this principle in creating full-scale cranes.

70,000 PSI INJECTION PRESS, recently developed at Argonne National Laboratory, is tried out by Dr Francis R Shonka, Argonne's director of instrument research and development. Press molds optical eyepieces for precision radiation exposure meters

Business Items

Galbreath Machinery Co recently moved its offices from 306 Empire Bldg, Pittsburgh, to 221 Corliss St, West End, Pittsburgh 20.

Thomas E Longley Co, Cleveland, announces formation of a Pump and Filter Div to handle sales and service of plant engineering and equipment maintenance supplies.

Renier Co, Inc, new engineering and designing firm, has established offices at 5209 Euclid Ave, Cleveland, where it will undertake complete design of machine tools, hydraulic presses and equipment. Firm is headed by William S Renier, former director of engineering for Hydraulic Press Mfg Co.

General Engineering Co, Ltd, Toronto, Ont., Canada, has opened offices at 431 Bulkley Bldg, 1501 Euclid Ave, Cleveland, to serve as engineering consultants, particularly in the production heating field.

Clyde Cutlery Co, 103-year-old Clyde, Ohio, firm, has been sold to a group of northern Ohio and Indiana investors.

Calumet & Hecla, Inc, metal producer and fabricator, has leased executive office quarters in the People's Gas Bldg, 120 S Michigan Ave, Chicago. Firm has mines and plants in Michigan, Wisconsin, Alabama.

Glenn L Martin Aircraft Mfg Co reports its backlog rose to $640 million in 1952, contrasted with $402 million backlog for '51.

Judd Industries, Inc, is a new firm specializing in small progressive stampings, located at 3148 West 32nd St, Cleveland 9. Heading the company as president is Charles H Judd, formerly general manager of Reid Products Div of Standard Products Co, Cleveland, and consultant to England's Simonds Aerocessories, Ltd. Other officers are Jeanne C Judd, treasurer, and John B Calfee, secretary and assistant treasurer. Directors are C H Judd, W C Knerr and J W Snider.

Coquipco, Los Angeles, is setting up distributorships throughout the country for its line of Campbell contour attachments for lathes and milling machines.

L C Allenbrand

Cyril G Veinott

Lawrence R Malm

Robert P Melius

L C Allenbrand, newly appointed general manager of Caterpillar Tractor Co's York, Pa., plant, heads a list of three key company appointments. Others are: **Hans Erich,** formerly assistant factory manager of the company's Tractor Div, to be York factory manager; and **Frank Bovenschulte,** previously head of the Merchandise Dept's Pricing Div, to succeed Mr Allenbrand as Merchandise Dept manager.

Dr Cyril G Veinott, electric motor design engineer, has resigned his post with Westinghouse Electric Corp to join Reliance Electric & Engineering Co, Cleveland, as consulting engineer on a-c machinery. He is past vice president of AIEE.

Charles W Hunter has been appointed general superintendent of Hudson Motor Car Co's Air Frame Div. He will supervise air frame production on fuselages for B-57 Canberra bombers and B-47 Stratojets. A USAF Colonel for four years, Mr Hunter was until recently manager of A O Smith Corp's Rochester, N Y, plant.

P C Smith has been named manager of Westinghouse Electric Corp's Transportation and Generator Div, East Pittsburgh, where he has been assistant to the division manager since 1944.

Earl D Foster has been named superintendent of gas turbine production for Solar Aircraft's Co's manufacturing division, San Diego. He was formerly assistant to the plant manager. Heading Solar's new gas turbine field service unit is **Fritz C Heinig.**

James M White has been elected vice president in charge of manufacturing for American Car & Foundry Co, succeeding **Robert W Ward,** who recently retired after 42 years' service. Mr White was for seven years vice president in charge of manufacturing for Allis-Chalmers Mfg Co, and more recently, with Allen-Bradley Co.

Robert P Melius, newly appointed merchandising manager for Skil Corp, Chicago, replaces **William Ferry,** who has been named industrial sales manager. **Jack T Carlsen,** former industrial sales manager, will direct the company's new Sales Training Div. Mr Melius was formerly with Rockwell Mfg Co's Delta Power Tool Div as vice president of sales.

James M Dehn has joined the engineering staff of Peter A Frasse & Co, Inc, New York, as field consultant on the application, selection and fabrication of stainless.

Jack W Rembe has been named sales manager for Rodney Hunt Machine Co, Orange, Mass. Formerly export manager for the firm, Mr Rembe will direct sales activities of Hunt's five product divisions.

Dwight A Bessmer was elected a vice president of Timken Roller Bearing Co, Canton, Ohio, at a recent board of directors meeting.

Warren E Hill, formerly executive vice president of Shellmar Products Corp's Flexible Packaging Div, has been named to Emhart Mfg Co's newly created post of vice president in charge of operations. He will direct all Emhart operations: Henry & Wright, Hartford-Empire and V & O Press Co Divisions.

G J Seifert of Matawan, N J, will represent Diamond Tool Research Co, New York manufacturer of resinoid bonded diamond wheels and diamond tools in southern New Jersey, eastern Pennsylvania, Delaware and Maryland.

Lawrence R Malm, since 1947 Pittsburgh representative for Heppenstall Co, steel forgings manufacturer, has been named district sales representative for the company at 208 S LaSalle St, Chicago.

A E Kimberly has been appointed chief engineer of Chrysler Corp's DeSoto Div, and **Robert Anderson** chief engineer, Plymouth Div. Mr Kimberly was formerly staff engineer in charge of Chrysler's Engineering Div mechanical laboratories. Mr Anderson's previous assignment was assistant body engineer in the Engineering Div.

Herbert D Euwer has been named chief passenger car engineer for American Machine & Foundry Co, succeeding **Allen W Clarke,** who is retiring after 46 years with the company. Mr Euwer will continue to headquarter at ACF's St Charles, Mo., plant.

Gerald E Smart, plant engineer at Allis-Chalmers' Norwood Works, will head its Plant Engineering Dept.

John Jeppson and **A Donald Kelso** have been named vice presidents of the Norton Co, Worcester, Mass. **Richard Prouty,** formerly assistant to the treasurer, is now assistant secretary. New directors are Mr Kelso and Howard J Daly, manager of Norton's Bauxite and Crude Abrasive plants.

William B Seibert is new head of Eastern Metal Products Co's Quality Control Dept, Tuckahoe, N Y.

Alexander Ross

H J Zilske

Luther H Bosnian

Wendell B Lund

Names in the News

Alexander Ross has been named chief engineer and **H R Sennstrom** executive engineer of American Locomotive Co's Locomotive Div, Schenectady, N Y. Mr Ross, who joined Alco's Canadian affiliate, Montreal Locomotive Works, Ltd, in 1932, was named engineer in charge of locomotive design for Alco last October. Mr Sennstrom was formerly research and testing engineer in charge of the company's laboratories.

John H Fassett, manager of Hilliard Corp's Clutch Div, Elmira, N Y, was named a director of the corporation at a recent board meeting.

Robert S Solinsky has been elected president and a director of National Can Co, succeeding **C L Thompson,** who will continue as chairman of the board. Mr Solinsky was formerly president of Cans, Inc, acquired by National Can last December. He is a past president of the Can Manufacturers Institute.

William A Reich has been appointed manager of Advance Development Engineering for General Electric's Carboloy Dept. He has for seven years been engineer in charge of G-E's Turbine Laboratory.

Lysle A Wood, since 1948 chief engineer for Boeing Airplane Co, has been named director of pilotless aircraft. Factory manager **Harold Abling,** appointed assistant to the operations manager in the office of the vice president, will be succeeded by **Charles Williams,** formerly superintendent of production manufacturing. **Howard Hurst,** who has been on a tour of duty at Tucson, Ariz, returns to his former position as superintendent of manufacturing. **Harvey Kent** has been promoted from assistant to general superintendent of the Renton plant.

H J Zilske has been promoted to chief engineer of Hydraulic Press Mfg Co's Hydraulic Power Div, Mount Gilead, Ohio. Mr Zilske has been with the division for three years and was formerly with Gerotor May Corp and Logansport Machine Co.

Luther H Bosnian has been appointed vice president in charge of manufacturing facilities for Chain Belt Co, Milwaukee. He has been with the company since 1919 and has been active in planning Chain Belt's ordnance operations. Also named to new posts are: **Lyman Newton,** controller; **F D Tincknall,** assistant treasurer; and **Bernhard G Schneider,** assistant chief engineer on conveyor equipment.

E M Richardson, formerly manager of eastern division sales for Nice Ball Bearing Co, Philadelphia, has been appointed sales manager.

Stewart E Lauer, first elected president of York Corp in 1940, was recently re-elected at a company board meeting. Also re-elected were: **John G Bergdoll, Jr,** vice president and general works manager; **John R Hertzler,** vice president and general sales manager; **Rodney F Lauer,** vice president, engineering and research; **J Keith Louden,** vice president and assistant to the president; **Donald M Mager,** vice president and controller; **Marshall K Munce** vice president, trade relations; and **William F Lynne,** secretary-treasurer.

Wendell B Lund, formerly general superintendent in charge of manufacturing for Saco-Lowell's Biddeford and Saco, Me., plants, has resigned to form the Lund Mfg Co at Biddeford, Me. Lund will manufacture standard and special cutting tools and will engage in contract machine and tool work.

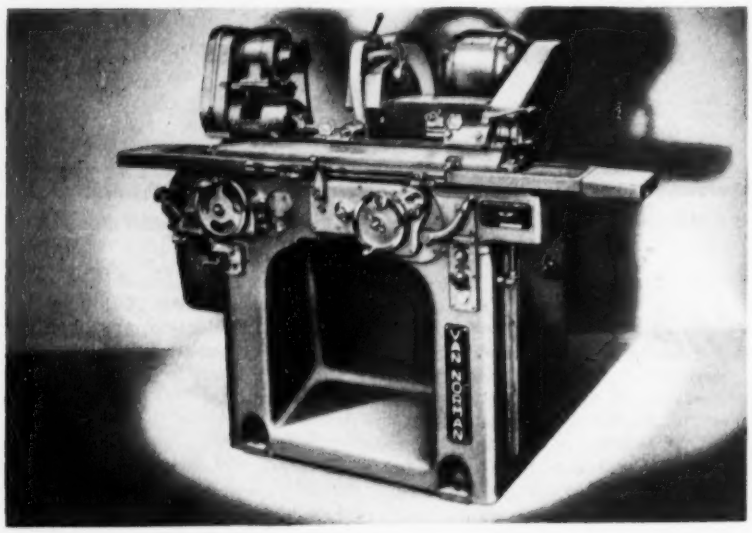
Walter C Loeman has been appointed production manager and **Robert C Dyrenforth** division engineer for Parker Appliance Co's Cleveland Valve Div, Cleveland. Mr Loeman formerly headed cost planning for the comptroller. Mr Dyrenforth joined Parker in 1952, from the Swartwout Co, where he was assistant chief engineer.

W Denis Kendall, formerly executive vice president, Brunswick Ordnance Corp, a subsidiary of Mack Trucks, Inc, has been named vice president of Mack Mfg Corp and will be in charge of all manufacturing at all Mack plants.

Marshall Hughes, named general master mechanic for Chrysler Corp's Jefferson and Kercheval plants, heads a list of six promotions at the two plants. Others: **Walter Mathews,** to replace Mr Hughes as master mechanic; **Charles Thiede,** on special assignment to the general master mechanic; **Arthur Susick,** Jefferson plant master mechanic; **George M Bushey,** assistant master mechanic at Kercheval; and **Camille Roy,** assistant master mechanic, Jefferson.

Theodore L Pantz, formerly works manager, Seeger Refrigerator Co, has been named vice president manufacturing for Servel, Inc.

New Shop Equipment



Van Norman Cylindrical Grinder Production-Grinds Small Parts

The model 418 grinder has been developed by Van Norman for fast, precision traverse or plunge cylindrical grinding of small parts on a production basis. It is adaptable for small parts in toolroom and job shop where work usually is in small or medium runs.

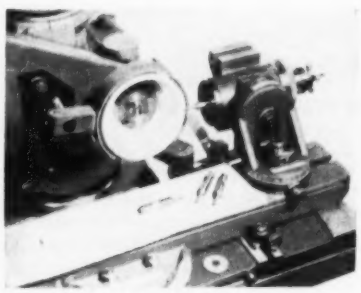
Grinding wheel speeds are 1772 and 2067 rpm; headstock speed is 153 to 940 rpm. Maximum grinding diameter is 4 in. with distance between work centers 18-in. max. Floor space required is 43½x79¼ in.

Recessed design of the base permits the operator to sit with all controls grouped within reach. The grinder is equipped with a Pope wheel spindle, automatic starting and stopping of headstock and table traverse, and semi-automatic lubrication. Wheel slide rapid retraction and slide base are said to be constructed for rigidity and maximum accuracy.

Work is said to be easily loaded, ground, and unloaded with minimum motion and effort.

The 418 grinder is intended for applications where minimum floor space is an important factor.

The Van Norman Co, Springfield, Mass



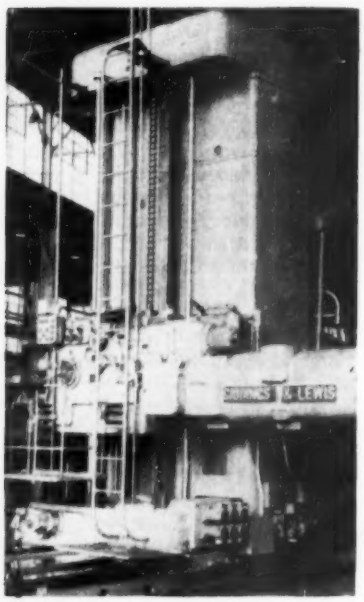
Brown & Sharpe Attachments Sharpen Small End Mills

Attachments for the No. 5 and No. 10N cutter and tool grinders built by Brown & Sharpe sharpen peripheral and end teeth of straight shank end mills from ⅛- to ⅜-in. dia. In operation, the tooth being sharpened is held in contact with the tooth rest while feeding the cutter across the wheel by longitudinal table movement.

Settings can be made at an angle in both horizontal and vertical planes. Zero marks 180° apart on the spindle body provide for sharpening both right-hand and left-hand cutters. Adjustable clearance gage at end of spindle, for use when sharpening peripheral teeth, has two scales 180° apart that read to 20° each side of zero.

No. 5 attachment (illustrated) has scale graduated 90° each side of two opposed zero marks in the horizontal plane, and 20° each side of zero in the vertical plane. No. 10N attachment is graduated to 360° in the horizontal plane and 90° each side of zero in the vertical plane.

Brown & Sharpe Manufacturing Co, Providence 1, RI



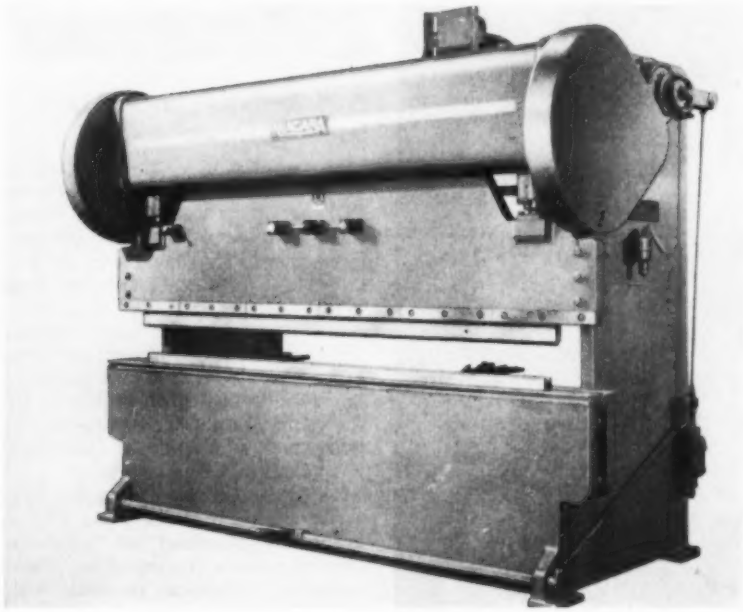
Column of G&L Machine Redesigned as Weldment

Model 780-F floor-type horizontal boring, milling, and drilling machine has a completely redesigned column. Instead of a casting, it is now a weldment. This is claimed to be the first time a large vertical boring mill component has been so constructed.

Equipped with an 8-in. spindle, the 780-F is part of the 70 series. Even with the headstock at the extreme height of the column, 13 ft above the floor plate, tests are said to have produced accurate milling and boring.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis

Materials and Parts



Niagara Welded-Steel Press Brakes Have Laminated Non-Metallic Ways

A line of press brakes of all-steel construction announced by Niagara Machine & Tool Works includes 50-ton, 100-ton, and 150-ton series. Operations include bending, curling, jogging, corrugating, notching, and punching.

Laminated non-metallic ways are said to maintain accurate alignment and reduce wear. Double-reduction gearing and double-end twin drive with gearing enclosed in sealed oil baths transmit power to the ram.

Air-cooled clutch and brake can be controlled either by treadle or by palm buttons that permit jogging, single stroking, or continuous operation. With a motor-reversing switch, the flywheel can be reversed to pull the ram out of accidental stalls.

Self-locking, power-operated, ram-adjusting screws are fitted with micrometer dials to permit duplication of settings for repeat jobs. By uncoupling the shaft between the screws, the ram may be tilted by power for tapered work.

Niagara brakes can be supplied with gages for front or rear, and with angle support brackets and bolster plates for stamping.

Niagara Machine & Tool Works, 637-697 Northland Ave, Buffalo 11, NY

Blind-Hole Lubricant Permits Tapping in Single Operation

Hypertap, a blind-hole tapping lubricant, eliminates operations preliminary to bottoming by its automatic-hydraulic removal of chips from the hole during the thread-cutting operation.

A stick of the material, equal in diameter to the hole, is inserted prior to tapping; hydraulic action forces the chip-laden lubricant up alongside the flutes of the tap and out of the blind hole. The compound contains a fine cutting oil which serves as a coolant during the operation.

Stick diameters range between 9/64 and 1 in., standard lengths are 3½ and 7½ in.; additional sizes on specification.

Destiny Products Co, 8427 Mack Ave, Detroit, Mich

... INCLUDING

Drilling machine with 8 spindles of 1¼-in. capacity has automatic cycle. page 208

Gear shavers available with automatic up-feed to provide choice of conventional or diagonal shaving methods. page 216

Boring mill has dual-purpose design for conventional or contour work. page 218

Switches with snap action can be operated by force as small as one-half ounce. page 220

Furnace has cast-iron dies for flattening work as it is tempered. page 224

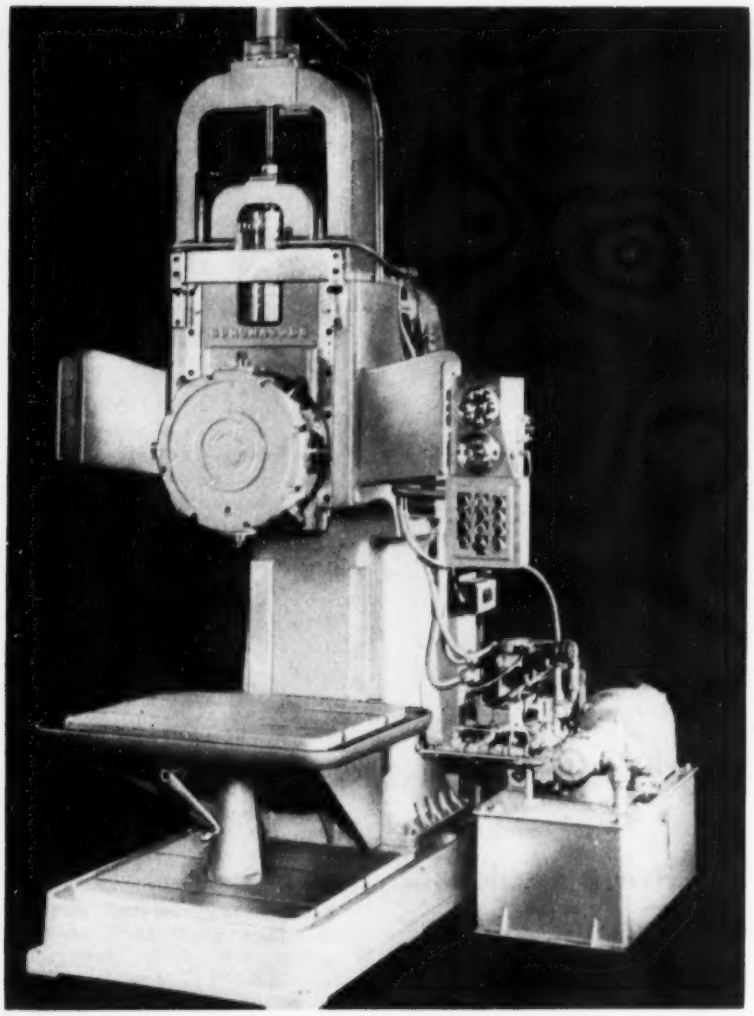
Torque wrench releases when pre-set torque is applied. page 226

Speed reducer has automatic shut-off device for overload protection. page 228

... and in Mar 2

Automatic dieing machine, 350-ton capacity, takes strip up to 25-in. wide, produces completely drawn and formed stampings.

Abrasive belt grinder form grinds buckets and blades for aircraft gas turbines



Burgmaster 8-Spindle Automatic Drilling, Tapping Machine

Model 3-BH Burgmaster automatic, hydraulic drilling and tapping machine incorporates in a larger machine the design of the present Model 2A.

This 8-spindle machine has 1¼-in. drill capacity in mild steel, 12-in. spindle and head travel, 19-in. table travel, and 17½-in. throat clearance. Table is 36x35 in. with T-slots. The 10-hp, 2-speed motor provides 12 spindle speeds from 167 to 1765—four to each spindle.

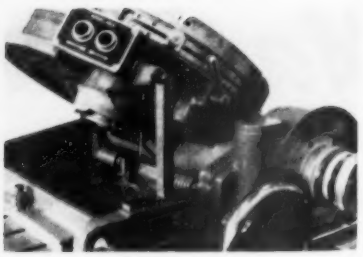
Automatic cycling is provided through any or all stations with rapid approach, feed, dwell, slow feed out, and rapid traverse out, preselective for each spindle. Spindle feeds are infinitely variable. Button controls are provided for set-up and hand operation.

Model 3-BH can be used for straight drilling operations or on forming for ID or OD turning, tapping, threading, plunge-cut end milling, large counterboring, spotfacing, and other second operations.

Burg Tool Manufacturing Co, 3743 Durango Ave, Los Angeles, Calif

Vimco Machine tool light is equipped with an extra-large adjustable arm to resist vibrational movement on punch presses and similar units. Socket and bulb are encased in a one-piece, heavy-formed steel reflector. Oil-proof wrapping prevents loosening from vapors and splashings. Switch is integral with mounting box.

Vimco Manufacturing Co, 109 Brayton St, Buffalo, NY



Pratt & Whitney Rotary Table Is Tilting, Power Rotating

Tilting rotary table, 24-in. dia, combines power rotation with settings to 2 sec of arc. A 3-phase, ½-hp, shell-type motor is built into the table pivot. The table can be rotated through 360° in either direction in any plane.

Fine adjustment is made by rotating table with a handwheel with a self-centering spinner knob. Table graduations in degrees are read off the table, in minutes on the rotary wheel dial, with a vernier indicating position in 2-sec intervals.

Table can be tilted from 0 to 90°. Table arc settings are made with a graduated quadrant on which a vernier reads to 1 min. of arc. More accurate settings can be made with gage blocks by the sine bar method.

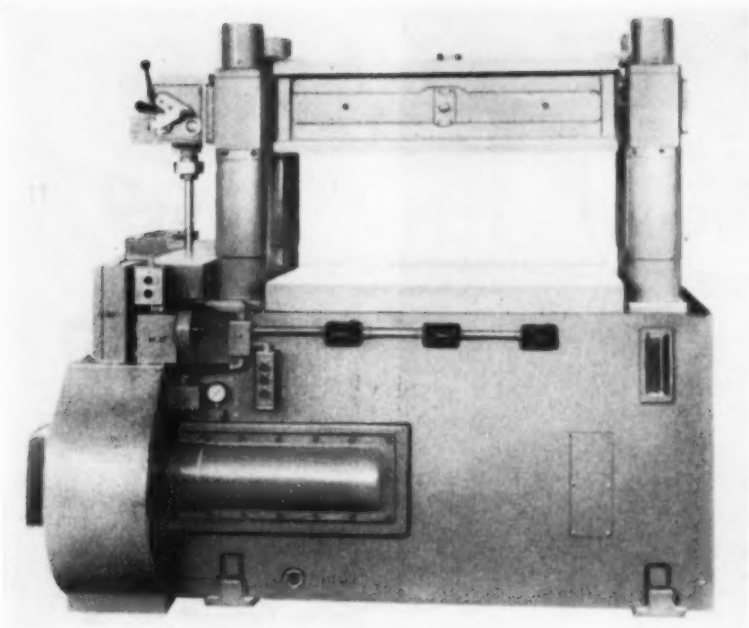
Pratt & Whitney, Div Niles-Bement-Pond Co, West Hartford 1, Conn

Mall Impact Wrench

Model 4EW Tork-Hammer electric impact wrench has a net weight of 16¾ lb, a spindle speed of 1800 rpm free.

Unit has a pistol grip with detachable side handle, a built-in trigger switch with lockring pin, ball and needle bearings, heavy-duty gears, and forced draft ventilation for cool running. It is equipped with reversible universal ac-dc motor, 115 or 230 v current. Hammer is mounted on antifriction bearings for smoother operation. Handles up to ⅞-in. nuts and bolts.

Mall Tool Co, 7725 S Chicago Ave, Chicago 19, Ill

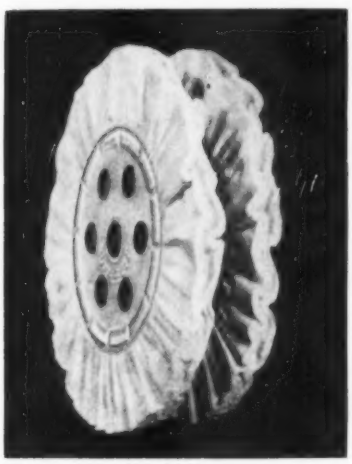


Alpha Die Tryout Press

Alpha 100-ton die tryout press occupies floor space of 75x84 in., overall height is 82 in.

Head can be quickly released and rotated to any point up to 240° which permits the operator to barber, spot, shear, fit, and finish both punch and die without removing die from the press. Four-post construction assures alignment of punch and die; drive mechanism is housed in the base and pulls the head down. The air-operated clutch is a combination flywheel type, with multiple-disk brake. Electrical controls of the clutch permit inching, single stroke, continuous operation, and forward or reverse movement. Capacity is figured at pinpoint tonnage at any one point in the bed. Unit has a 6-in. stroke and operates efficiently at 50 strokes a minute.

Alpha Tool Works, 9281 Freeland Ave, Detroit 28, Mich



Self-Ventilating Buffs

Self-ventilating Ruff-L-Buff may be used for hand or machine operation. When two or more are combined to make up a buffing wheel, ventilating air enters the wheel through holes in the fiber-board centers of the buffs.

As the wheel rotates, centrifugal force drives the air through 12 channels between each buff to the cloth portions of the buff where numerous ruffles distribute the air over the buff side and channel it on through the wheel, cooling it as it goes. This permits wheel to be operated at higher speed with greater pressure applied between work and wheel, resulting in faster buffing with less wear. Bias construction of cloth exposes the maximum number of thread ends to the work, producing more cutting action per revolution.

Units are available in standard and heavy-duty weights with diameters of 12, 14, 16 and 18 in.

Hanson-Van Winkle-Munning Co, Matawan, NJ

Frequency-Counting Instruments

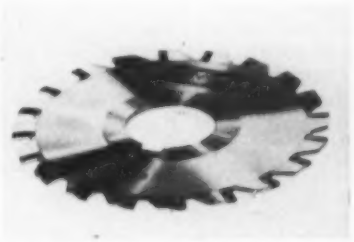
Four new models of Potter frequency-timing-counting instruments are now available. The new line is smaller, lower-priced, and lighter weight.

Simplified frequency counter units 820 and 830 are designed for rapid and accurate production test measurements.

Models 840 and 850 frequency-time counters contain all the timing, gating, and switching facility necessary for the widest possible range of measurement functions, including direct counting of frequencies up to 1 megacycle, or timing the period of a cycle within 10 microseconds.

Panel indication may be either the Potter 1-2-4-8 decimal readout, or the ten lamp 0 - 9 readout.

Potter Instrument Co, Inc, 115 Cutter Mill Rd, Great Neck, NY



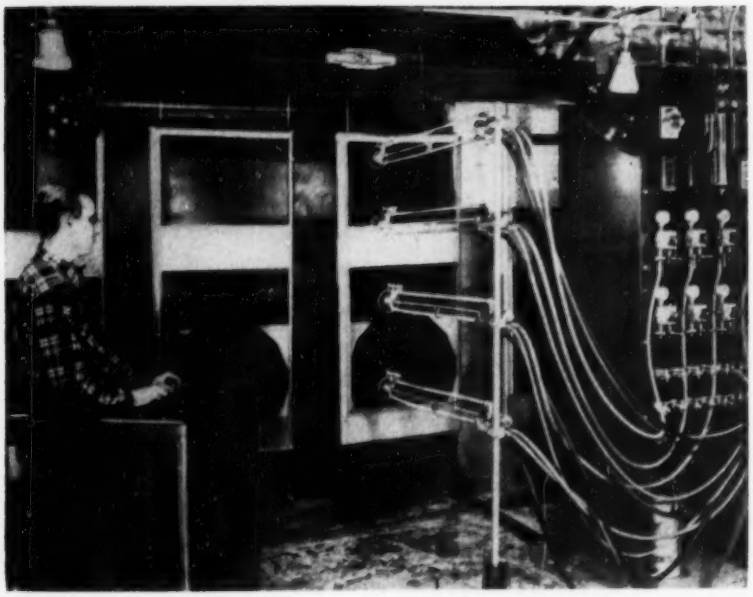
Carbide Contour Saws

Gay-Lee Thinsaws are being supplied with contour tooth forms. This permits use of carbide in cutting slots that require a form and where it has been necessary to use steel cutters in the past.

A wide variety of convex forms, including radius and radius with angles tangent and their variations, can be produced to specifications.

Carbide tips are brazed into a circular pocket to insure against tip displacement. They are available in diameters up to 8 in. and in thicknesses of 0.030 in. and up; solid carbide saws are available from 0.020 in. up. Either type can be produced with contour tooth form so that proper re-sharpening does not destroy the contour.

Gay-Lee Co, Clawson, Mich



Electronic Paint Spray Gun Charges Paint Particles

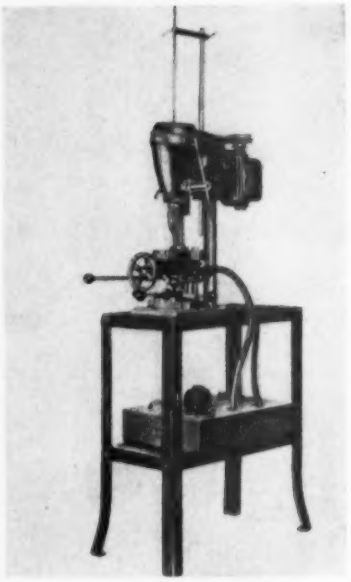
Ionic gun for electronic paint spraying is designed on the principle of charging the paint electronically within the spray apparatus itself.

Installations with external, electrically charged screens, which did not give uniform ionization of the paint spray, were efficient only for painting flat or smooth surfaces. With this device, paint is said to be highly ionized so that it differentiates between painted and unpainted surfaces, producing an even finish and penetrating all cavities.

The unit is claimed to sell at approximately one-third the price of older units.

Equipment includes an ionic high-potential power supply and control; installations will accommodate power outputs of all standard voltages.

Scientific Electric, Garfield, NJ

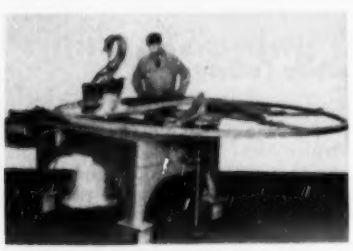


Smaller Turnomat Machine

New turnomat machine has been designed to permit added high-speed production of small turnings without tieing up larger equipment. A complete unit in itself, it turns to small diameters in one plunge cut and to almost unlimited lengths; it is equipped to taper, knurl, center, form, thread, drill, and ream.

Has capacity up to 1¾-in. bar stock, with four interchangeable heads which permit change in minutes from 1/32- to 1¾-in. bar stock capacity.

Turnomat Co. Inc, Brockport, NY



Cogmatic Flame Cutter Cuts, Hardens Gears

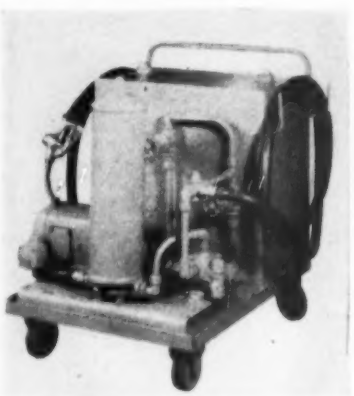
Three-spindle flame cutter for producing gears and sprockets is said to cut alloy steel as quickly as mild steel. It hardens while cutting with a coolant stream.

Jury spindle attachment (illustrated) makes it possible to produce sprockets or gears that are actually bigger than the machine itself. Multiple-spindle design permits automatic production of three gears or sprockets at a time, in diameters up to 15 in.; two at a time up to 25-in. dia. Unit is said to be capable of machining as much tooth metal per hour as is possible with three conventional gear-cutting machines. It automatically produces over 200 shapes and sizes of teeth, 5 to 200 teeth per wheel, diameters 5 to 108 in.

Cogmatic Co, 1330 N Franklin Place, Milwaukee, Wis

Non-Slip handwheel on Lunkenheimer valves has four finger-spaced lugs projecting from the stem hub. Design permits operator to get a firm grip and apply high pressure, even with wet or greasy hands. Shape of the wheel eliminates burning from contact with valve stem.

The Lunkenheimer Co, Cincinnati 1½, Ohio



PORTABLE HYDRAULIC FILTER UNITS pump oil from machine, through the filter, and back into machine, or into tanks for transport and storage. Equipment includes portable tank with 55- and 20-gal. sections; filter; model 20 pump; ½-hp motor. – *J N Fauver Co, Inc, 49 W Hancock, Detroit 1, Mich*

UNION

Unretouched Photograph by Morton Berger

Perfectly designed for its job . . . .

Union's long experience in the cutting tool field reflects itself in the excellent performance of every tool it makes.

UNION TWIST DRILL COMPANY • ATHOL, MASSACHUSETTS

Milling Cutters **Gear Cutters** **Twist Drills** **Hobs** **Reamers** **Carbide Tools**

OWNERS AND OPERATORS OF: **S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.** TAPS, DIES, SCREW PLATES
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BUTTERFIELD DIVISION, Rock Island, Quebec MILLING CUTTERS, TWIST DRILLS, HOBS, REAMERS, TAPS, DIES, SCREW PLATES

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giant-sized bearings

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With every size in SKF's wide range of ball and roller bearings, you receive an extra quality—*team-work*. This is the ability of SKF field and home office engineers to cooperate productively with your equipment designers. Helping to solve their bearing problems is the *extra* which all industries have learned to expect from SKF.

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SKF INDUSTRIES, INC., PHILA. 32, PA.— *manufacturers of* SKF *and* HESS-BRIGHT *bearings.*

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder

WEBBER GAGE COMPANY
12900 TRIBKETT ROAD · CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

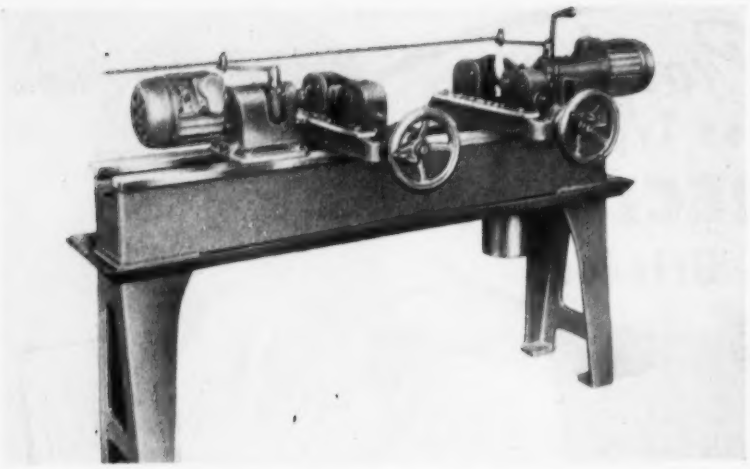
- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio



Double-End Centering & Drilling Unit Handles Multi-Shaped Workpieces

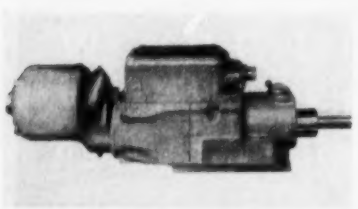
Model CME double-end centering and drilling machine (Swedish) has been designed for accurate centering of round, square, hexagonal, and octagonal workpieces.

Bed, with oil pan, has cross ribbons to eliminate warping and deflection. Two heavy heads are equipped with ½-hp, 220/440-v, 60-cycle, 3-phase electric motors for direct drive; spindles are mounted in tapered roller bearings, with hand-operated lever. Two vises, adjustable lengthwise on the bed, are opened and closed by handwheel.

Adjustable jaws, which move upward and outward simultaneously by turning handwheel to release workpiece, are thin, to permit centering of short workpieces.

Special stop to fix axial position is supplied on all units.

Imported by Machine & Tool Co, 29-28 41st Ave, Long Island City 1, NY



Multi-Purpose Drill Unit

Air-powered hydraulic drill unit No. 19-600 has been added to the Delta line. Designed for heavy-duty drilling, tapping, reaming, spot facing, hollow milling and similar operations, the unit can be quickly set up, has versatile feed control, fast traverse to positive stops, compact design, and universal mounting.

Device has a max stroke of 6 in. and an 1800-lb thrust with 80 psi air pressure. It can use up to a 5-hp motor and a 1⅛-in. drill. Standard spindle used contains a No. 4 Morse internal taper. Positive micrometer stop, infinitely adjustable from 0 to 6 in., controls length of stroke; depth can be held to within 0.005 in.

Rapid approach is at a max rate of 5 in. per second with infinite adjustment in length up to full stroke of the unit by means of a positive stop. Rapid return has max rate of 4 in. per second. Built-in switches permit interlocking with other drill units or equipment.

Delta Power Tool Div, Rockwell Mfg Co, 400 N Lexington Ave, Pittsburgh 8, Pa.

Flow Control Valve

New flow control valve, equally efficient for air or hydraulic use, provides full flow in one direction and a wide range of adjustment in the opposite, or controlled direction.

Unit incorporates a floating retroball check, and an improved gland structure of the needle. This structure combines the O-ring sealing principle with an adjusting locking feature in a compact design. A light, helical spring does not load the ball, but locates it in the most sensitive floating position to the seat, regardless of the position in which the valve is mounted. Increased sensitivity permits use in a wide range of control applications.

Valves are available in five pipe sizes—⅛ in. to ¾ in., made from solid hexagon bars of brass, aluminum, steel, and stainless. Male end fitting tube adapters are available in the same material as valves. Operating pressure to 5000 psi.

Pneu-Trol Devices Inc, 1436 Keating Ave, Chicago, Ill

Automatic Chuck Processes 4-in. Pipe in 44 Seconds

This power-operated automatic chuck threads, reams, and cuts 4-in. pipe in 44 seconds. Unit is equipped with die heads for processing pipe in sizes of 2½, 3, 3½, and 4 in.; adapters are available for handling ½- to 2-in. pipe.

Thred-O-Matic 44 has eight hobbed jaws, four front, and four rear, which grip pipe tighter as torque is applied. Transmission has four speeds forward and reverse; coupled with the two-speed motor, there are eight forward speeds.

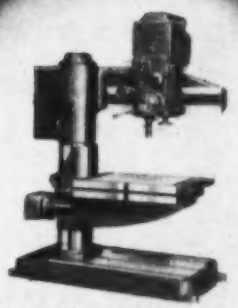
Flat blade reamer attached to the die head cleanly reams inside of pipe during threading; may be removed for running threads. One screw simultaneously adjusts all dies for changing depth of thread. Cutter mounted on the front jaw housing allows operator to place fitting on pipe immediately after threading.

Quijada Tool Div, Gaines-Collins, 5474 Alhambra Ave, Los Angeles 32, Calif

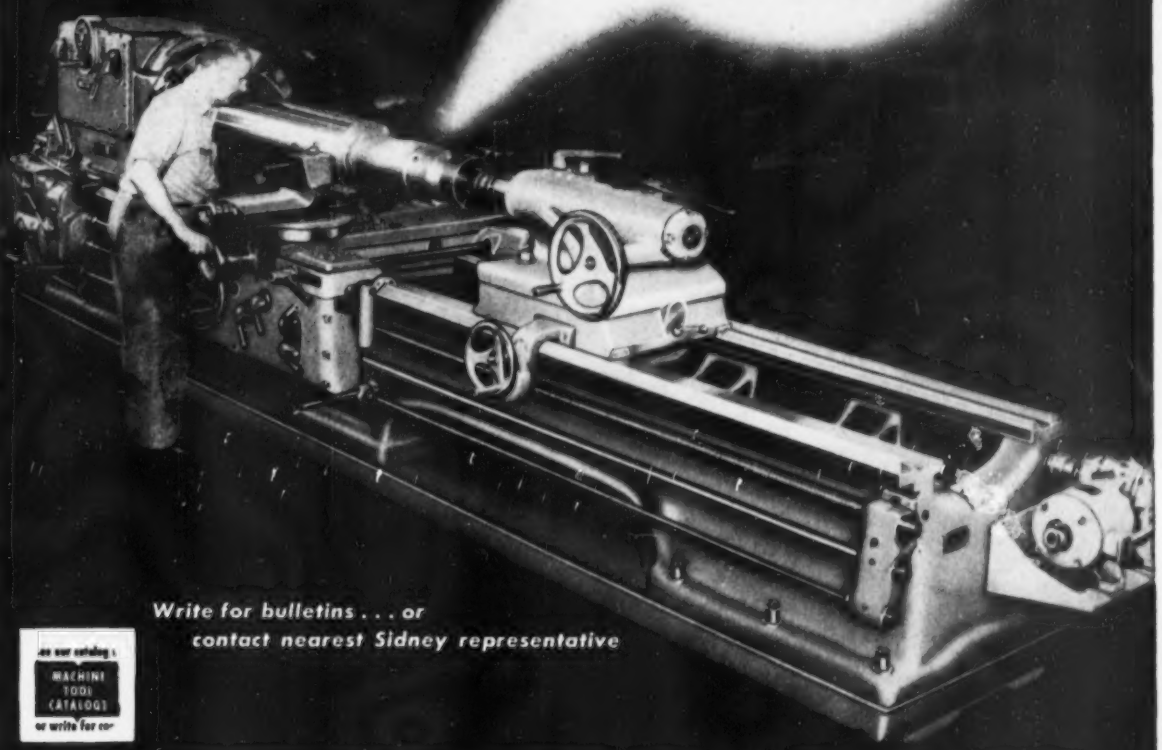
SIDNEY
HEAVY-DUTY LATHES

DESIGNED FOR ACCURACY
•
BUILT FOR LONGER LIFE

Here is a 32-inch Model 16 Sidney Lathe turning columns for 3 and 4-foot sensitive radial drills. Carboloy tools are being used on semi-steel. Speed: 300 feet per min. Photograph taken in plant of Fosdick Machine Tool Co., Cincinnati, Ohio.



FOSDICK RADIAL DRILL



Write for bulletins . . . or contact nearest Sidney representative

MACHINE TOOL CATALOG

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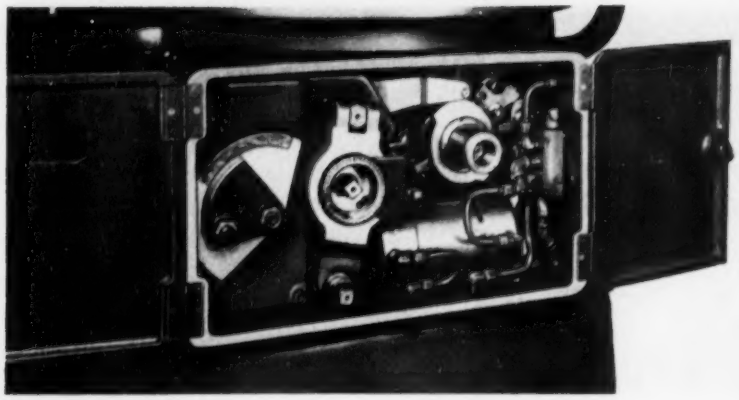


Automatic Up-Feed Available for Red Ring Diagonal Gear Shavers

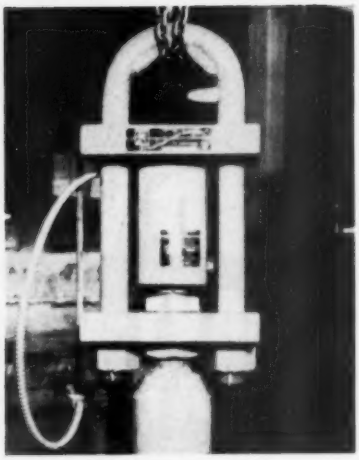
A mechanism has been developed by Red Ring engineers that, when installed in diagonal gear shaving machines, provides automatic precision up-feed in selected increments throughout the shaving cycle and automatic return to the proper backlash position for loading and unloading at the end of the cycle. This offers a choice of conventional or diagonal shaving in one unit.

When shaving diagonally the cycle is no longer limited to two strokes. It may now include several cutting strokes, each with its own increment of up-feed, and one or more idling strokes. Despite this, cycle time has been decreased by rapid up-feed and increased cycling speed. The mechanism is claimed to provide higher production, greater accuracy in the work, and an increase in cutter life.

In conventional shaving the operator does not have to use a handwheel to bring the work gear into shaving mesh with the cutter, nor lower it for unloading. These operations are part of the automatic shaving cycle, removing any possibility of serration marks on gear tooth surfaces.

The cam accommodates a combination of various feeding cycles. To reduce the number of cutting strokes, only part of the cam surface is used. Repositioning or changing the cam takes only a few minutes.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich

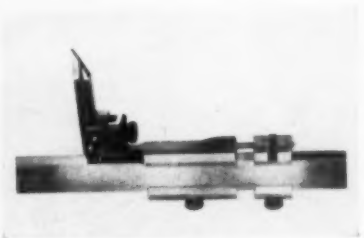


Crane Load Scales

Electronic scales for weighing crane loads are available in capacities including 10 tons per hook.

Scales utilize the Baldwin SR-4 load cell, translating changes in weight into changes in electrical energy. Instrumentation is provided by which the force exerted on the load cell may be recorded and printed, either in the crane cab or remotely. Contact scales are easily installed, operated, and maintained.

Streeter-Amet Co, 4101 Ravenswood Ave, Chicago 13, Ill



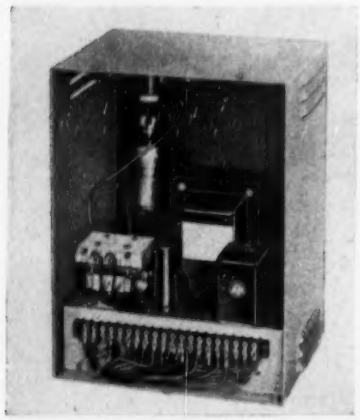
Height Gages Have Clamp For Dial Indicator Use

Several improvements added to Homestrand height gages in the 12-, 18-, and 24-in. sizes increase the versatility of these instruments.

Gages are now equipped with a universal clamp which eliminates need of an extra attachment when dial gage use is necessary. Clamp can be used with practically any dial indicator; extra screw on the side simplifies shank width adjustments.

Marker has been modified so that it can be used with a depth measuring rod attachment without the use of an extra clamp; depth gage is included. Attachment arms are identical in size for both the 18- and 24-in. units.

Homestrand, Inc, Larchmont, NY



Electronic Variable Speed Drive Employs a Series Motor

The Electronic Variable Speed Drive for fractional hp motors is a packaged drive consisting of an adjustable speed control unit driving a series motor.

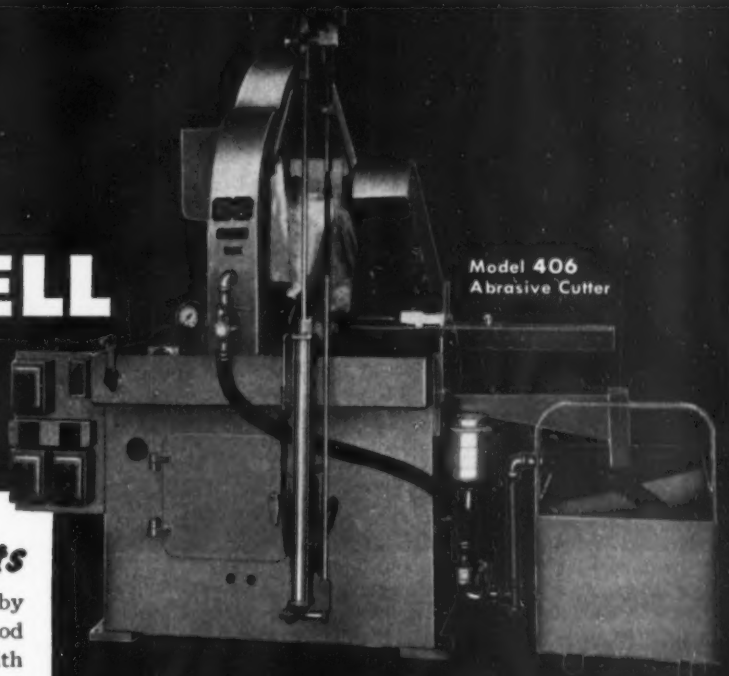
Provides a wide, stepless range of control with good speed regulation under varying loads. With the optional dual range feature, speeds from 100 to 3500 rpm are available. Motor can be started, stopped, or dynamically braked, and can be rapidly accelerated to pre-set speeds.

Motor utilizes both ac and dc current output from a single thyratron tube; this is said to result in much higher speeds at medium torque, higher starting torque at slow speeds, longer tube life, and lower tube replacement costs. The Push-Pull Selector Switch is used as a pilot device.

The Arrow-Hart & Hegeman Electric Co, 103 Hawthorn St, Hartford 6, Conn

an ACCO product

CAMPBELL ABRASIVE CUTTERS


Model 406 Abrasive Cutter

Fast, Low Cost Cuts

● Cutting any type of material by the CAMPBELL Abrasive method produces high quality parts with excellent finish and dimensional accuracy, often saving subsequent operations. CAMPBELL machines control heat in both work and cutting wheel. Wheel is entirely enclosed in safety guard. Many models are available. Ask for *"Principles of Abrasive Cutting."*

Tell us your cutting problem and we'll make recommendations.

Model 223 Abrasive Cutter

Model 15 Abrasive Cutter

and CAMPBELL NIBBLERS

● The modern way to cut sheet metal to any desired shape. High speed, variable stroke. Quick and inexpensive. Literature will be sent on request.

Model 2524 Nibbler

ACCO

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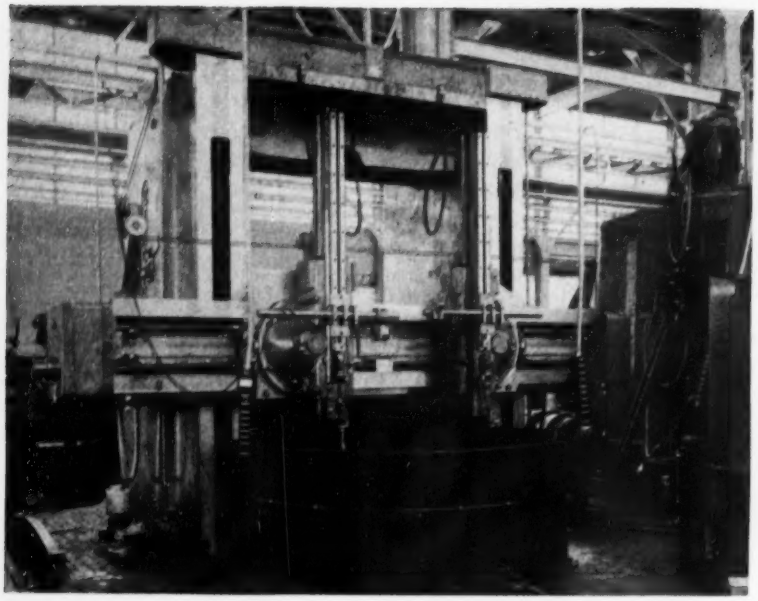
CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL Abrasive Cutters and Nibblers

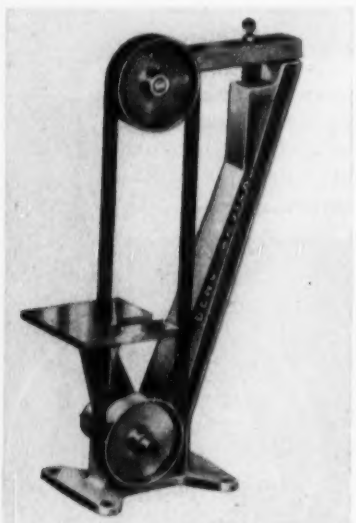


Giddings & Lewis Boring Mill Does Conventional and Contour Work

Dual-purpose vertical boring mill is capable of working either as a conventional machine or as a contour mill. This 8-ft machine has two additional motors mounted on each end of the cross rail. One motor operates the saddle and the other the ram of the left-hand head. The same arrangement is provided for the right-hand saddle and head.

A separate motor is used for traverse, feed being accomplished through a mechanical take-off from the table-motor gear train. Thus the mill can operate conventionally with a separate motor drive, or as a contour mill with the additional motors on the cross rail.

Giddings & Lewis Machine Tool Co, Fond du Lac, Wis



Benchmaster Belt Sander

Benchmaster belt sander for fine burring, grinding, and polishing operations on metals, has 4-in. dia belt wheels mounted on wide, double-row, double-sealed ball bearings. Bearing life is estimated in excess of 10,000 hr.

Trackage adjustment insures positive wheel alignment. Top wheel supporting arm is rocker-mounted, as well as pivoted for belt takeup. Spring load insures correct belt tension when using the back-up plate. Pivoted back-up unit retains its parallelism with the belt at any angular setting of the table.

Unit, driven with a V-belt, operates with a ¼-hp, 1750-rpm motor. It is designed for any speed up to 8000 sfm.

Benchmaster Manufacturing Co, Gardena, Calif

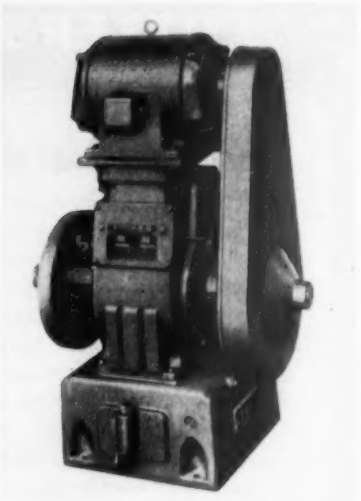
Toggle Clamps

Eight new toggle clamps, designed for toolrooms requiring individual clamps with greater thickness capacity, are available in the Lapeer line.

Series are plier type; five of them have horizontal handles, and three, vertical. All have long, thick, flat bases with extra base plate optional. Clamping range is from 3-15/32 to 6-15/32 in., with throat capacity of 2¼ in., and 1-11/16 to 6-15/32 in., throat capacities of 1¼ to 2¼ in.

Base plate is available in soft metal, equipped with two bolts for attaching, or in hard metal, already installed, including parallel jaw 1-in. thick.

Lapeer Mfg Co, Lapeer, Mich



Stokes Improves Vacuum Pump

Stokes Microvac pump Model G has been improved in a number of ways over its predecessor, Model F.

A shaft seal has been installed to minimize maintenance. There are no stuffing-boxes, valves, or adjustments. Lubrication is completely automatic, and freedom from leakage is guaranteed. New valve-stops prevent the copper-beryllium springs from reaching coil-to-coil compression at any time. Stops permit use of the units in a broad range of applications, including rapid cycling evacuation of large-volume systems.

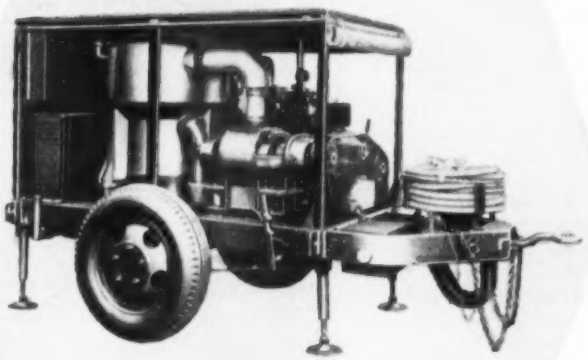
Side-entrance intake acts as a baffle against entering solids; additional protection is afforded by a screen filter.

Every part of the pump is easily accessible for cleaning. Solenoid valve in the oil supply line automatically prevents oil-flooding of the pump and vacuum system in the event of power failure.

F J Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20, Pa

FRESH WATER FROM THE SEA ...?

USE REVERE METALS!



Portable Diesel-driven sea-water compression still, producing 85 gallons of pure water per hour. Made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., which also makes stationary installations for chemical, paper, pharmaceutical and similar plants, for production of pure water or recovery of valuable by-products.

This is a portable compression still, which produces pure distilled water from the sea at the rate of 85 gallons per hour. It is made by Cleaver-Brooks Company, Special Products Division, Waukesha, Wis., an important producer of stills, either portable or stationary, for the Armed Forces and for industry. An important feature of Cleaver-Brooks design is the selection of metals in accordance with the water conditions to be met, whether salt, brackish, contaminated, or requiring recovery of valuable by-products. Thus, for example, the heat exchanger, of the tube-within-a-tube type may have cupro-nickel tubes and headers, or Admiralty tubes, naval brass, silicon bronze, according to the nature of the service. Such care in selection of metals is in part at least responsible for the high reputation Cleaver-Brooks enjoys.

In addition to supplying Revere Metals, we were also requested to collaborate with engineers and production men on fabrication methods, including forming, brazing, welding and annealing. Cleaver-Brooks is a large and well-staffed company, and its experience is such that it is capable of conducting its operations unassisted. However, like so many companies, it likes to have others double-check its conclusions and methods, to protect itself and its customers. The Revere Technical Advisory Staff was glad to respond to the call.

Such work is typical of the collaboration Revere offers to you through its salesmen, its Technical Advisors, and the Research Department. Remember, we do not take the place of your own engineers, designers and production people; we consult with them, and make our knowledge freely available, on a confidential basis, of course. Call the nearest Revere Sales Office. Consult your telephone book or write direct.

REVERE

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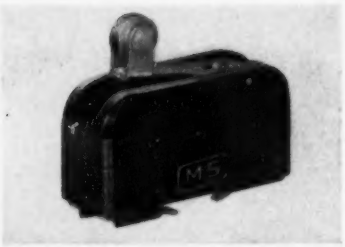


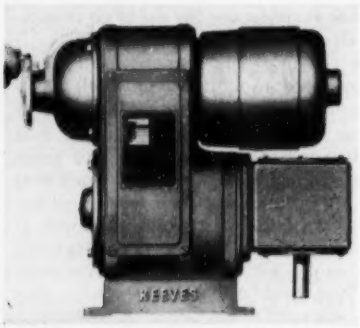
Micro Low-Force Switches

Snap-action switches designed for actuating forces as low as ½ oz have rigid-lever integral actuators for operation by cams or straight-line motion.

Type W80 has a flat lever actuator. Type W82 has a hardened steel roller on the end of the lever to reduce friction in cam actuation. Type W822 has the roll on a shorter level for fast cam actuation or for applications in which compactness and maximum resistance to vibration are required.

Available with solder lug or screw terminals, they are listed for 15 amp, 125, 250, or 460 volts, ac; ½ amp, 125 volts, dc; ¼ amp, 250 volts, dc.

Micro Div, Minneapolis-Honeywell Regulator Co, Freeport, Ill



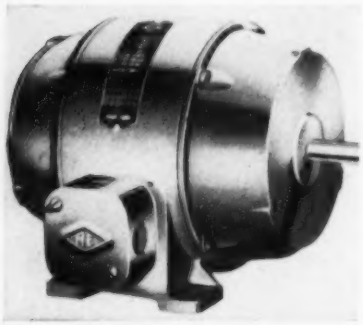
Reeves Variable-Speed Right-Angle Drive

The Motodrive with right-angle reducer combines in one unit any standard NEA frame, type C, face-mounted motor; the Reeves speed-varying mechanism, and the new right-angle worm gear reducer. The reducer is available on all fractional hp Motodrives in horizontal and vertical models with speed ratios from 2:1 through 10:1.

Output shaft drives up, down, or at right angles in the horizontal models, and down or at right angles in the vertical models. This makes it possible to mount the drive flat against the machine, or directly above or below the driven equipment.

Alloy steel helical worm and bronze gear of the reducer are built for heavy duty, continuous operation. Handwheel control is standard, but electric remote and mechanical automatic controls can be applied.

Reeves Pulley Co, Columbus, Ind



Reuland Multi-Speed Motors

New Reuland Multi-speed motors can be operated at different speeds to fit the needs of special jobs. They are available in 2-, 3-, or 4-speed ratings in constant torque, variable torque, or constant hp types. 2-speed motors are supplied with either 1 or 2 windings; 3- and 4-speed units with 2 windings only.

Constant torque model is designed for equipment where loads require a nearly constant turning effort, regardless of motor's speed. The hp output varies directly with rpm.

Variable torque motor is especially suited to powering loads that develop and maintain their momentum. Reduction in operating speed is accompanied by a much greater reduction in required operating hp.

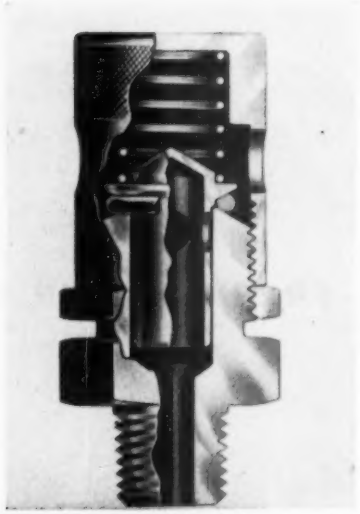
Constant hp unit provides special versatility on jobs requiring a constant amount of power, such as a lathe where various speed and cutting characteristics are required for different dias of work.

Motor sizes range from 12 to 150 hp. Available in either standard, totally enclosed, splash- or explosion-proof designs. Also available as motoreducers and with magnetic brakes.

Reuland Electric Co, Alhambra, Calif

LPG relay plug-in units are completely enclosed, dust-proof, and may easily be taken apart. Over 100 standard circuits are available, many with universal features permitting changes in the operating sequences in the field with simple terminal connections. Unitized construction permits assembly into any number of multiple stations from a single unit to many hundreds in the same system.

Tigerman Engineering Co, 4332 N Western Ave, Chicago 18, Ill

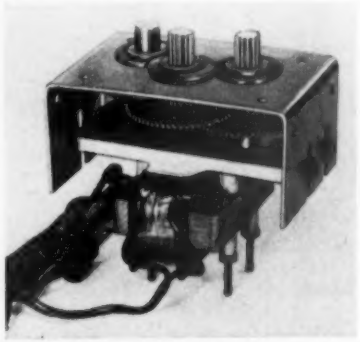


Low Pressure Relief Valve

Series 5400 valves are available for relief pressures from 2 to 45 psi. Relief pressure can be pre-set at the factory or adjusted in use. The valves use the "Circle-Seal" principle with an O-ring that is self-aligning between two conical seats of a poppet valve.

The valves are designed for controlling gases safe to release into the atmosphere from systems where leakage cannot be tolerated. They are available in aluminum and brass, or other materials on special order.

James-Pond Clark, 2181 E Foothill Blvd, Pasadena 8, Calif



Geared Midget Electric Motors

Kasson Roto-Sho series of midget electric motors with gear trains includes seven models semi-enclosed with bracket and one open model. The motor is the company's standard shaded-pole, induction-type unit.

Fiber and metal gears can be supplied with single or multiple shafts to give one or more speeds from 1 to 1150 rpm. They are suitable for valve controls, electric control drives, remote control devices, and other applications.

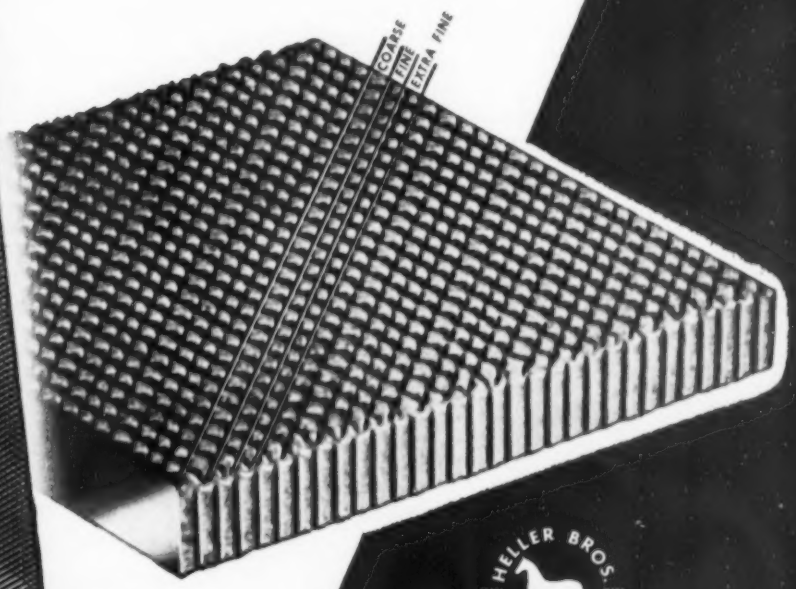
General Die and Stamping Co, 262 Mott St, New York 12, NY

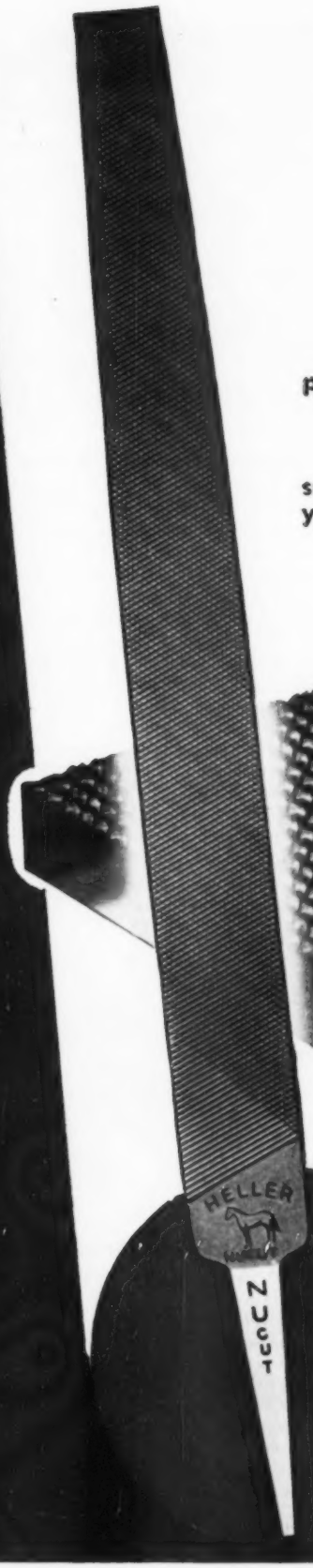
Heller NUCUT files

do two jobs

at every stroke!

Two distinct sets of teeth make possible double-action filing at every stroke. The coarse teeth cut clean, deep, true without scraping or skidding. On the same stroke, the fine teeth leave the work surface sleek and smooth. Order through your local distributor.





look for the white tang

HELLER BROS. SINCE 1836

American Swiss

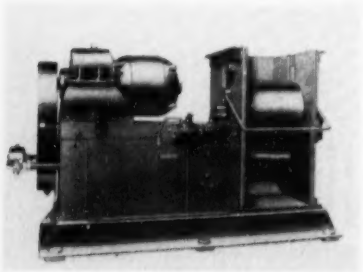
VIXEN NUCUT

Shelf Trucks

This Bay shelf truck is 36½ in. high, including casters. Each shelf with a 2-in. flange, is attached to legs by 16 bolts and lock nuts. Bottom shelf is fixed with flange turned up; others are reversible.

Trucks are furnished with two 5-in. rigid casters, and two 5-in. swivel casters, either rubber or steel.

Bay Products Inc, 3001 N 16th St, Philadelphia 32, Pa



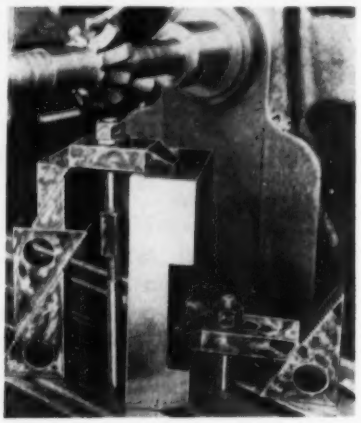
Bundler Forms Stringy Scrap Into Compact Cylinders

Scrap bundler, designed for handling material of a stringy nature, forms scrap into compact cylinders for easy handling, storing, shipping, and re-melting.

It is recommended for bundling steel, aluminum, brass, and lead, either in wire or strip form. Model 18 forms a roll 18 in. in dia, 18 in. long; Model 24 produces a 24x24-in. roll.

Machine forms scrap into cylinders around a revolving spindle. An air pressure system discharges the material. Spindle is withdrawn and a pusher ram rolls bundle out of the hopper. Spindle and ram are returned to positions by the system. Model 18 has a 10-hp gear motor, Model 24, a 15-hp unit. Operating speed of the spindle is 45 rpm.

McLanahan & Stone Corp, Hollidaysburg, Pa

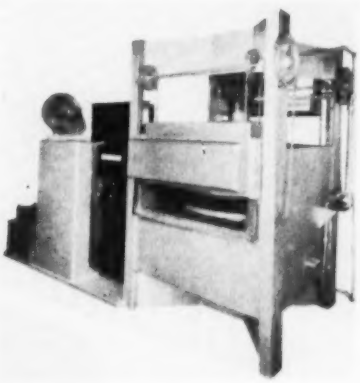


Beveled Strap Clamps

These strap clamps, designed for rigid clamping, are beveled on the nose for cutter clearance.

Available plain or step, in lengths of 2½, 4, and 6 in. to handle from ⅜- to ¾-dia studs.

Northwestern Tool & Engineering Co, 117 Hollier Ave, Dayton 3, Ohio

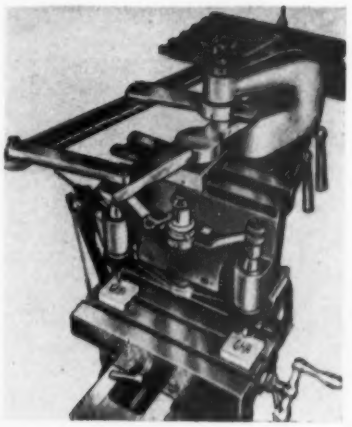


Waltz Furnace Flattens, Tempers Thin Work

Furnace for flattening and tempering large, thin, circular pieces such as circular saws, has a temperature range from 350 to 1000 F. The gas-fired burner fires into a combustion chamber on the inlet side of the recirculating fan.

Inside the furnace are two large circular cast iron dies, 42-in. dia, one of which is fastened to the bottom of the cylinder rod with a ball and socket joint. The bottom die rests on a steel structure but is not fastened rigidly. The Vickers hydraulic unit is mounted at the base.

Waltz Furnace Co, Dept 1, 1901 Symmes St, Cincinnati, Ohio



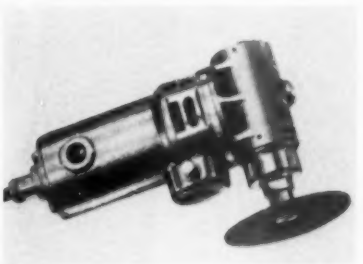
Two-Spindle Engraving Machine

The pantograph of the Alexander two-spindle engraving machine transfers the engraving movement from one master to two copying spindles. Two rigid roller slides, working at right angles to each other, provide the movement for the spindles. Construction permits extreme sensitivity, and is said to produce highly accurate engraving.

Both cutters are set on the same plane. Spindles can be adjusted individually and instantly to equalize the depth of cut. Coarse and fine adjustments for both spindles are controlled by a single lever.

Max working area for each is 4x4 in.; distance between them is 9 in.

J Arthur Deakin & Son, 150-28 Hillside Ave, Jamaica 2, NY



Diskette High-Speed Grinder

Model B-2 Diskette, replacing the B-1, is a portable electric hand tool for high-speed grinding, filing, polishing, and other operations. It has a no-load speed of about 9000 rpm.

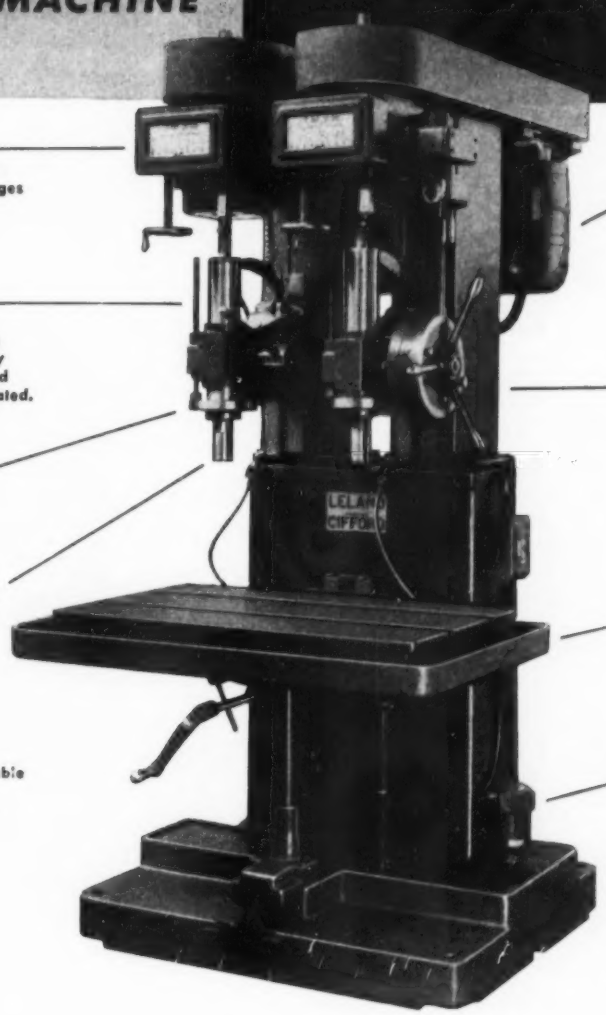
Greater air intake is provided by a new cast-aluminum cover with a double cooling fan added. These changes permit more extended use without overheating. A collet chuck is now incorporated in the spindle for all attachments.

Franklin Balmer Corp, Baltimore, Md

ALL THE FEATURES YOU WANT IN A HEAVY DUTY DRILLING MACHINE

the new

LELAND-GIFFORD No. 3 MVB



Leland-Gifford indicating shift for instant speed changes without stopping machine.

20-tooth involute spline spindle for greater rigidity, less wear. Independently counterbalanced and continuously lubricated.

Flanged quill for mounting multiple (spindle) heads.

Capacity of No. 3 or No. 4 Morse Taper.

Base, column and table ruggedly built for maximum rigidity.

Totally enclosed, fan cooled, ball bearing NEMA motor mounted at rear and driving through V belts.

Semi-automatic power feed with 3 feed rates, automatic adjustable depth stop and safety slip clutch. Hand or hydraulic feed also available.

New design table with removable top for easy refinishing.

Coolant pump and tank readily accessible for cleaning.

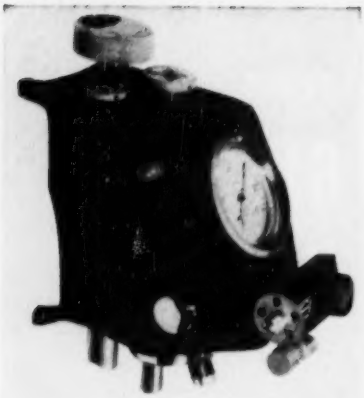
24" SWING
1 to 4 SPINDLES

Write For Complete Information

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



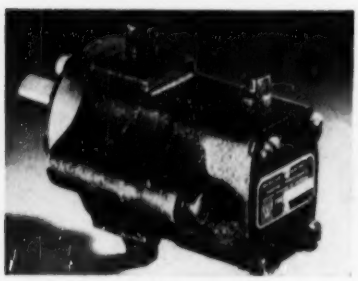
Portable Hardness Tester For Wide Variety of Metals

The Penetrascope, a portable metal hardness tester, tests ferrous and non-ferrous metals in a wide range of sizes and shapes.

A variety of standard clamps, electro-magnetic, chain, and C-clamps, are available. Special combination of Penetrascope and electro-magnetic stand can test many normally inaccessible parts of large assembled or partly dismantled units.

Instrument has a 136° pyramidal diamond indentor that makes a minute impression under controlled load; diagonals of the impression are measured within an accuracy of 0.001 mm. Load on the indentor can be set at any point from one to 30 kg. Ball type indentors of 1- and 2-mm dias are available for testing cast iron and other large grained metals.

C Tennant, Sons & Co, 100 Park Ave, New York 17, NY

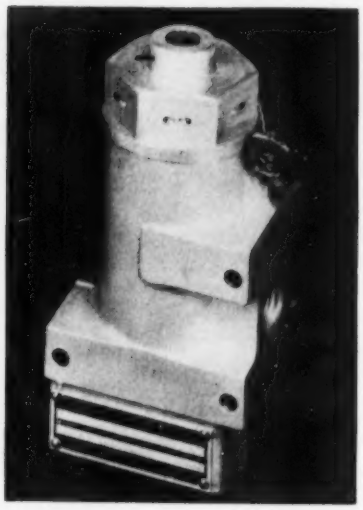


Hydraulic Oil Pumps

LAM Series gear type pumps are designed for use in fuel oil systems for oil transfer or filtering. With the addition of a pressure-regulating valve, they can be used as a supply pump for high-capacity oil burners.

Pumps will handle No. 2, 3, or 4 fuel oil, or preheated No. 5. Five sizes are available, with capacities ranging from 10 to 65 gph at 1800 rpm and 100 psi. An internal relief valve is available which can be set between 50 and 200 psi by a simple manual adjustment. The units are also available as 115/230-v motor-pump combinations.

Oil Hydraulics Div, Webster Electric Co, 1900 Clark St, Racine, Wis



Pressure Relief Valve

This cartridge type pressure relief valve is insensitive to back or system pressure. Valve eliminates the effects of system or back pressure so that relief pressure stays constant over a wide range of back pressure.

Unit is especially applicable for aircraft use, but it is adaptable to many industrial uses.

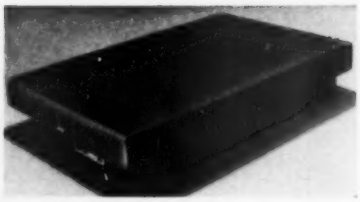
Pantex Manufacturing Co, Hydraulics Div, Pawtucket, RI

Plastic Safety Goggles

AO 481 safety goggles provide frontal and lateral protection through clear plastic lens, and transparent, green, vented binders which fit snugly to the face.

It is of the same construction as the AO 479 (all clear), and the AO 480 (all green). Designed to provide protection over a wide area against flying particles and spattering chemicals in light industrial operations.

American Optical Co, Southbridge, Mass



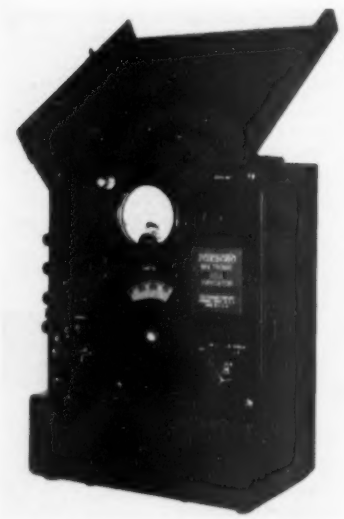
Black Granite Surface Plates

These surface plates, with guaranteed accuracy up to 0.00005 in., are made from a dense, extremely hard and uniform grained black granite.

Plates are said to be rust- and warp-proof, regardless of temp changes or shock. It is additionally claimed that they resist abrasion and impact, and develop no humps or burrs.

Plates weigh 190 lb per cu ft; available with two or four lips in sizes from 12x18x4 in. to 24x36x6 in.

Lawley Granite Surface Plate Co, 1412 Packard Bldg, Philadelphia 2, Pa



Force of Automatic Chuck Jaws Measured by Foxboro Indicator

Gripping strength and distribution of forces in an automatic chuck can be checked with the Nultronic indicator and a suitable force cell. The instrument is connected to the cell which in turn is held in a jig mounted in the chuck.

With the cell in position opposite a jaw, and the chuck closed, the balancing knob is adjusted until the null indicator reads zero. From the reading on the center scale the loading force can be determined in pounds or other units.

When each jaw has been checked, chuck power can be adjusted to equalize jaw forces. The instrument is said to be accurate to ± 0.1%.

The Foxboro Co, Foxboro, Mass

Miller HIGH PRESSURE HYDRAULIC CYLINDERS

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

DELIVERY

Our normal delivery is now 8 to 10 weeks or longer whenever possible. However, we can make occasional deliveries to meet your **RUSH** cylinder requirements as follows:

Standard Models except as noted below	4 - 5 weeks
Models 81 and 82	6 - 7 weeks
Water-Fitted Models	7 - 8 weeks
Precision Seal and other "Specials"	8 - 9 weeks or longer

All Delivery Promises Are Dated From Our Receipt of Complete Information At Our Plant

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

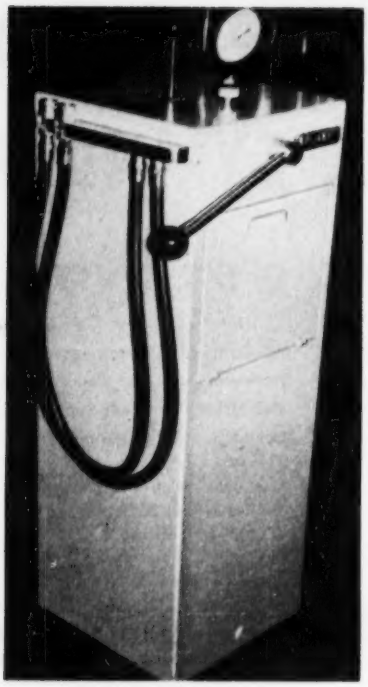
CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR COMPANY

2004 N. HAWTHORNE AVE., MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS



Leak Check Stand Tests Small Castings

This hydrostatic leak check stand has been developed to test for leaks in small castings and inter-drilled passages in a variety of parts. Hand-pumped pressures up to 1000 psi are available; volume per stroke is approximately 1 cu in.

A 4-way poppet valve is used to permit evacuating a cavity as well as filling it; needle valve is used to insure holding pressures over long periods of time. Quick connective couplings are standard; adapters, usually O-ring sealed, are designed to suit specific applications.

Various size units are available, either hand-operated or motorized.

Planet Products Corp, 6305 Warrick St, Cincinnati 27, Ohio

Ceramic Tumbling Media

Crown Pebs, a media for barrel tumbling, de-burring, and finishing, are made of tough, white ceramic, of uniform size and triangular shape.

They are available in a variety of sizes; by selecting the proper size, the lodgement hazard, encountered when conventional random-shaped natural or synthetic stone chips lodge in holes or slots, is eliminated. Uniformity of chip shape and density is said to produce uniform processing results.

Crown Rheostat & Supply Co, 3465 N Kimball Ave, Chicago, Ill

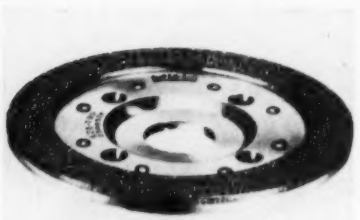
Proto Torque-Limiting Wrench

A wrench for nut and bolt torquing without the usual indicating devices, limits the torque by releasing automatically at the proper torque. A fully enclosed precision spring under compression is the principal torque-controlling element.

Desired torque on the Proto wrench is set by turning the handle like a micrometer. When the right torque is reached, the wrench releases. When pressure is removed, the wrench resets automatically for the next operation. Models are available with ratchet heads.

Capacities are 5 to 75 or 10 to 150 ft lb with drive sizes ⅜ or ½ in.

Plomb Tool Co, Los Angeles, Calif



Diamond Wheel Trueing Method

Super-Cut has developed a diamond wheel trueing method to mount and line up cup type diamond wheels used on machines with backplates. Process eliminates necessity for shimming up low spots when backplates are out of alignment.

Eze-Tru method involves auxiliary tapped openings in wheels which are fitted with small screws. By selectively tensioning these screws against backplate of machine, the diamond cutting surface can be quickly and accurately brought into a true plane at right angle to the rotation of the spindle. Available on 6-, 7-, and 10-in.-dia shallow or plain cup type wheels.

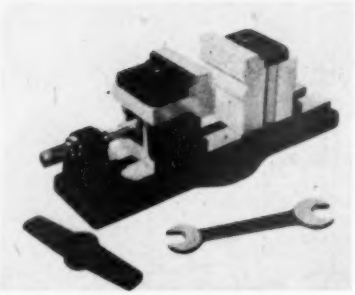
Super-Cut Distributors, Inc, 3418 N Knox Ave, Chicago 41, Ill

Hone for Carbide Tools Sharpens Tools On Machine

A hand hone developed for on-machine sharpening of single-point carbide tools is claimed to give 30% longer tool life between grinds. A few light strokes are made with the hone, taking care to hold it flat against the surface to avoid rounding the edges or changing relief angles.

The XL hone is made from silicon carbide with a vitrified bond.

Chicago Wheel & Mfg Co, 1101 W Monroe St, Chicago, Ill

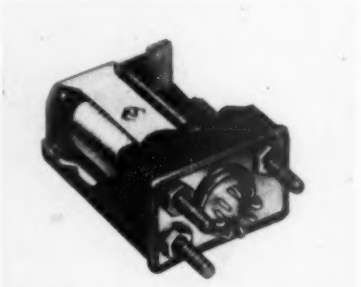


Vise Has All Clamping Parts Incorporated in One Unit

This Brown utility vise is designed to reduce setup time and eliminate costly jigs. All parts necessary for clamping work securely and accurately are included in this one compact unit. Few adjustments are needed to clamp the work securely into position; accuracy is said to be increased, since wobble and play are eliminated.

Rear turret of the vise revolves, presenting four different faces for holding various kinds of work, including round, square, octagonal, rectangular, flat, or angular-shaped pieces, vertically, horizontally, or at an angle. Auxiliary jaws at the top of each turret can be spread at an angle to hold odd-shaped work. Available in two sizes.

Brown Engineering Co, Reading 2, Pa

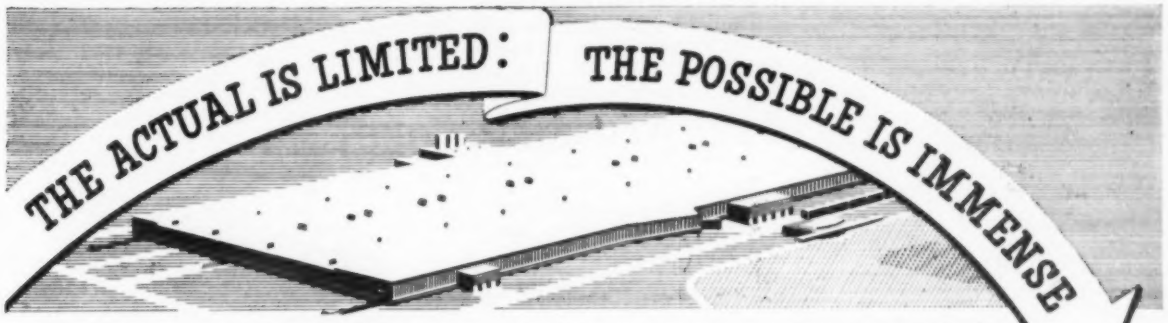


Sealed Miniature Relays

Miniature Class S relays are available in a new hermetically sealed enclosure. Entire unit measures 2 1/32x31/32x1½ in., and weighs 1⅞ oz. Mounting studs may be arranged on base or narrow side of housing.

Designed for minimum inductance and maximum make-and-break speeds, the unit is tamper-proof and atmosphere-protected. Recommended for applications wherever extremes of shock, temperature, and vibration are present.

Automatic Electric Sales Corp, 1033 W Van Buren St, Chicago 7, Ill



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1953

WELDED STEEL DESIGN SIMPLIFIES PRODUCTION . . . CUTS COST ON MACHINE TOOLS

by **William B. Boice**

Boice-Crane Company, Toledo, Ohio

COSTLY machining operations like milling castings can be eliminated by designing for welded steel construction. On our jointer, for example, the top surface is now finish ground to close tolerance in one setup after welded assembly. Wherever machining is required, with steel construction precision tolerances are often held in one cut as compared to rough and finish cuts required on most castings.

Since steel is twice as rigid as gray iron, less material is needed to resist deflection under load. If made from castings, our jointer would weigh twice as much and still be subject to inaccuracies from deflection and warpage no longer experienced in the present welded steel construction.

With less material, less machining and fitting involved, shop costs are reduced. Furthermore, the modern appearance achieved with the welded design has greatly improved selling appeal.

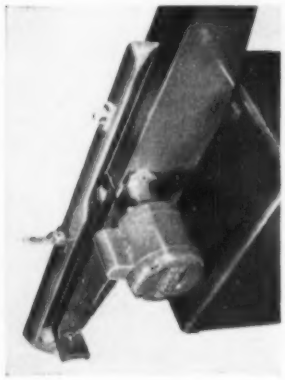


Fig. 3. Welded steel design *of 8" jointer is stronger, more rigid yet weighs half as much and costs less than cast construction. Courtesy, Boice-Crane Co.*

Fig. 4. Efficient girder-like structure *forms rugged frame for table. Top is welded to frame with intermittent welds and finish ground in one setting.*

WELDED DESIGN ALWAYS SAVES STEEL AND LOWERS COST

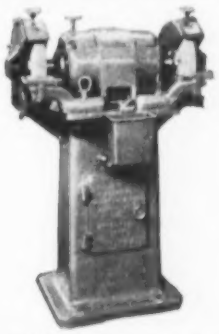


Fig. 1. Original construction *of pedestal grinder required costly milling and drilling using heavy machine tool equipment. Casting had to be filled and painted to obtain quality finish for sales appeal.*

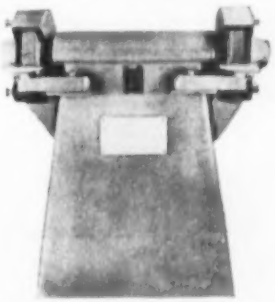


Fig. 2. Present welded steel design. *Quality of product and appearance improved to enhance sales appeal. Stability increased by lowering motor into pedestal base. Weight is cut 35% yet product is more rigid and costs 12% less to produce. Courtesy, The Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.*

MORE PROOF

Machine Design Sheets available on request. Designers and Engineers write on your letterhead to Dept. 2002

THE LINCOLN ELECTRIC COMPANY

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

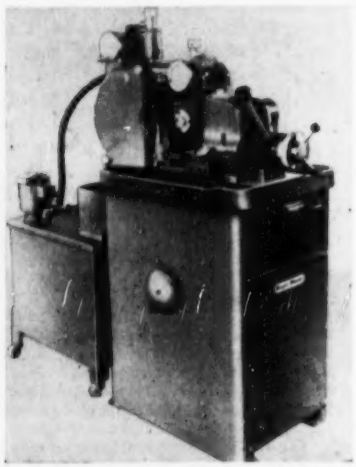
Compound Ratchet Indexer Has 6720 Possible Stations

Select-O-Matic indexer can be mounted in place of the conventional ratchet or friction clutch on power press roll feeds.

Hardened steel ratchet wheel has 210 teeth which are engaged by a double set of pawls, 16 per set. Combination permits a total of 6720 possible stations. When attached to a roll feed with 2-in. dia rolls, unit will index within 0.006 in. Accurate feeding can be accomplished at speeds up to 500 strokes per minute.

Indexer is 5¾ in. OD, available in three sizes: standard duty, heavy duty, and extra heavy duty. Standard duty unit, priced at $165, is designed for over 75% of all feeding requirements.

Durant Tool Supply Co, 155 Orange St, Providence 3, RI



Royal Master Centerless Grinder Handles Work to 1-in. Dia

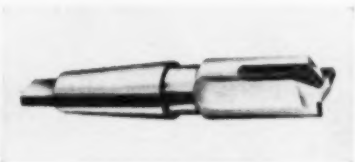
Model TG-123 centerless grinder is for straight or contour work from 1/16- to 1-in. dia. Tolerances are claimed to be consistently held to 0.0003 in. Floor space required, not including the coolant tank, is 23x36 in.

Regulating wheel has an infinitely variable speed drive with a range from 30 to 480 rpm. This gearless drive is said to eliminate the possibility of a gear tooth pattern on the work. The regulating wheel is mounted between ball bearings.

The grinding wheel spindle is mounted in preloaded ball bearings that are permanently lubricated. Standard equipment includes manual wheel dressers of the contour dressing type.

Coolant tank is a separate unit mounted on casters. Auxiliary equipment includes bar feed and infeed work rest, hydraulic power unit for multiple production, and hydraulic wheel dresser.

Royal Master Metal Products Co, State Highway 23, Riverdale, NJ



Penetrating End Mill

A three-fluted, center-cutting, carbide-tipped end mill has been added to the Super Tool line.

Designed specifically for non-ferrous metals and non-metallic materials, the tool is capable of penetrating end cutting, as well as routing, etc. Said to be useful in many operations where the conventional carbide end mill cannot be used.

Available in both straight shank and B&S taper shank in six sizes ⅜ in. to ¾ in., inclusive.

Super Tool Co, 21650 Hoover Rd, Detroit 13, Mich

Micronic Filter Can Be Mounted Within Hydraulic Systems

A micronic filter for hydraulic systems has been designed for mounting within the oil tank or reservoir, with removable head exposed.

A built-in, shut-off valve permits standard filter replacement without draining the tank. Unit may also be mounted externally.

Operating features include high flow rate with minimum pressure drop. Tests with a 25-micron filter on 210 SUS oil at 90 F indicate a flow of 24 gpm with a pressure drop of only 1 psi.

Unit is 25½ in. long, with an 8-in. dia; inlet and outlet connections are 2-in. female ips.

Rucker Manufacturing Co, 4516 Hollis St, Oakland 8, Calif

Speed Reducer Has Automatic Shut-Off for Overloads

Philadelphia worm gear speed reducer, designated type H A T, incorporates an automatic, instantaneous shut-off device for overload protection. The double torque control eliminates need for a sheer-pin coupling.

When a predetermined load limit is reached, motor current is cut off by direct mechanical action of the overload; only removal of excessive load is necessary to resume operation, eliminating re-setting or replacement of parts.

Range of hp and ratios from 3⅝ to 1, up to 6300 to 1 is available.

Philadelphia Gear Works, Venango & G Sts, Philadelphia 34, Pa

Metal Washing Machine Processes Varied Parts in Twin Tunnels

A metal cleaning machine has been designed with two tunnels for processing different size pieces simultaneously or separately.

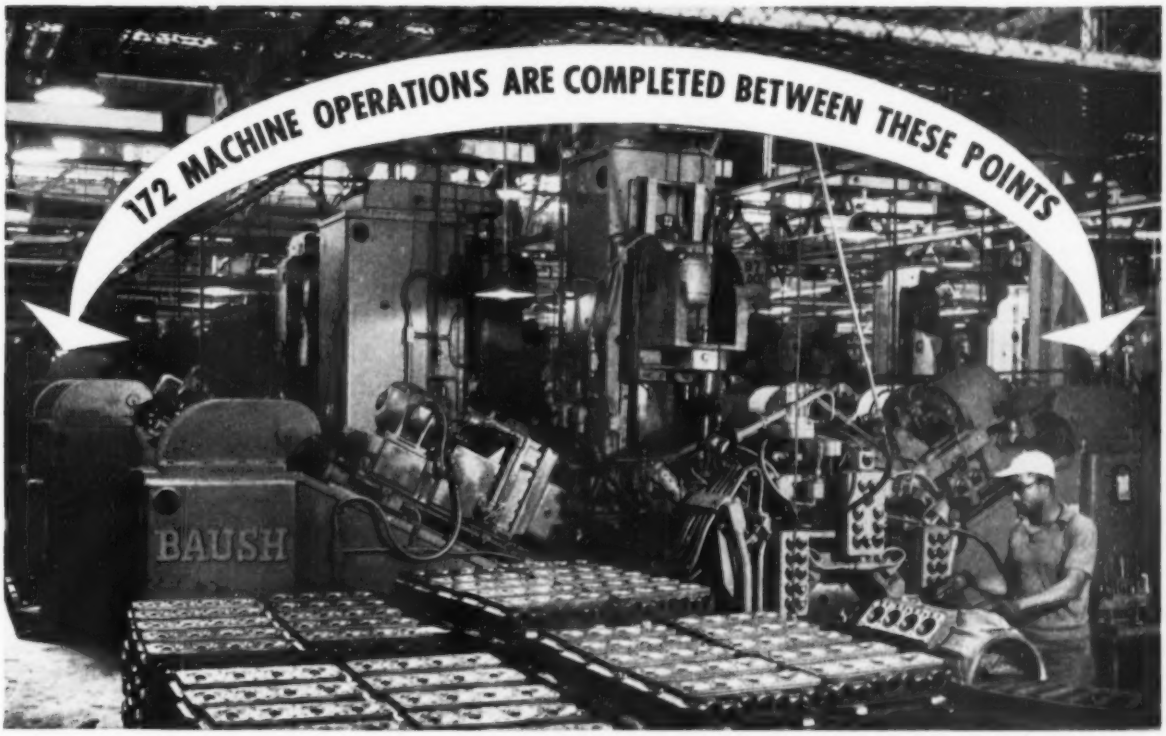
Parts carried on the plant monorail conveyor system are carried through the washing machine without attention, following loading at the work station, and are unloaded at the painting station.

Miscellaneous large and small parts are carried on a wire mesh belt through washing, rinsing, and drying operations in a second tunnel, located below the first one.

Monorail speed is 25 fpm; process times are: 30 seconds wash, 20 rinse, and 60 dry. Conveyor-belt speed is variable between 10 and 30 fpm; process times are: 72-24 seconds wash, 48-16 rinse, 150-50 dry. Two pumps supply solution to the spray arrangements in both washing sections simultaneously or singly in any proportion.

The Cincinnati Cleaning & Finishing Machinery Co, Schmidt Bldg, Cincinnati 2, Ohio

Baush Automatic Transfer Lineups Simplify Multi-Spindle Operations...



Overall view of twin Baush 10-Station Transfer Lineups

With this Baush 10-Station Automatic Transfer, 116 holes, ranging from 3/16" to 2" diam., are drilled on top and bank faces of the V-8 cylinder block of a popular automobile.

20 of these holes are drilled — sixteen are counterbored, and 20 are chamfered. In all there are 172 operations performed automatically by this one lineup.

SPECIAL FEATURES . . . EXCLUSIVELY BAUSH!

1. Each machine individual.
2. Accurate leveling of one machine to another is unnecessary.
3. Each machine has own electrical controls.
4. Each machine has built-in low pressure hydraulic transfer.
5. Each machine has constant-pressure hydraulic cam clamping.
6. One or more units can be added to lineup for added operations.
7. Exceptionally flexible — 2 lineups can be operated as one.
8. Construction is exceptionally heavy and rugged.
9. Line can be broken to add roll-over fixture to clear chips, automatic indexing, or checking fixture, even after machine has been installed.
10. Years of design experience gives maximum production with minimum maintenance.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

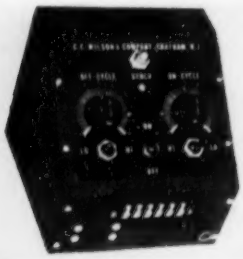
Our many years of designing special automatic multi-spindle machines is yours to use at any time — just drop us a line — tell us your problem, and Baush Engineers are at your service.

Spirol Fasteners in Small Sizes

Spirol pin fasteners have flexible coils that, when compressed by driving or pressing into a hole, provide radial spring action. New diameters include 1/32, 0.052 and 3/64 in. They are made in Types 302 and 414 stainless, the latter heat-treated.

Sizes now range from 1/32- to ½-in. dia, with length from 1/8 to 4 in. The new sizes are intended for optical and instrument applications.

C E M Co, 2½ School St, Danielson, Conn



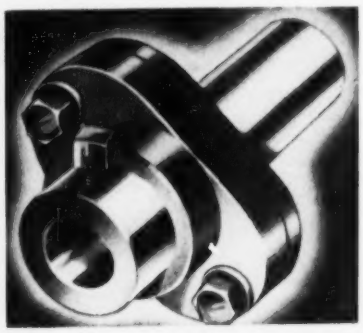
Electronic Repeat Cycle Timer

This electronic repeat cycle timer can be used for regulation of automatic machinery, sampling, valve pacing, and heat sealing, as well as laboratory testing such as heat cycling and refluxing.

The device uses a single electron tube to charge a resistance-capacitance network so that on cycles are adjustable from 0.2 to 200 seconds and off cycles range from 0.1 second to 1 minute.

Unit is encased in a sloping steel front cabinet, 6x6x6 in. for operation on 105/120 v, 60-cycle ac. Output is supplied to a double-pole, double-throw relay for non-inductive loads up to 10 amp at 115 v or 2 amp at 460 v. Relay contacts are wired to a plug or a terminal strip to facilitate installation.

G C Wilson & Co, 2 North Passaic Ave, Chatham, NJ



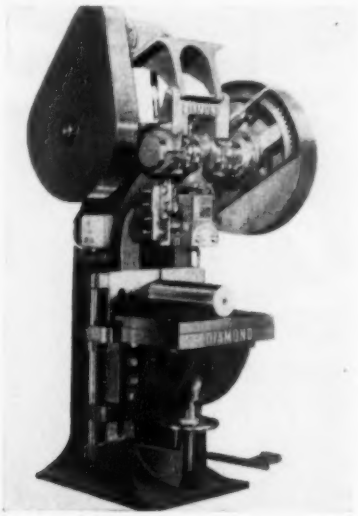
Releasing Tap Holder Aligns Turret and Work Spindle

Correct alignment between turret and work spindle can be quickly accomplished with this releasing tap holder.

The tool is available in five sizes to fit all hand screw machines and turret lathes; bodies and heads are forged for greater strength and durability.

Holder is easily changed for right- or left-hand tapping. Releasing mechanism is enclosed for maximum protection of moving parts.

Boyar-Schultz Corp, 2110 Walnut St, Chicago 12, Ill

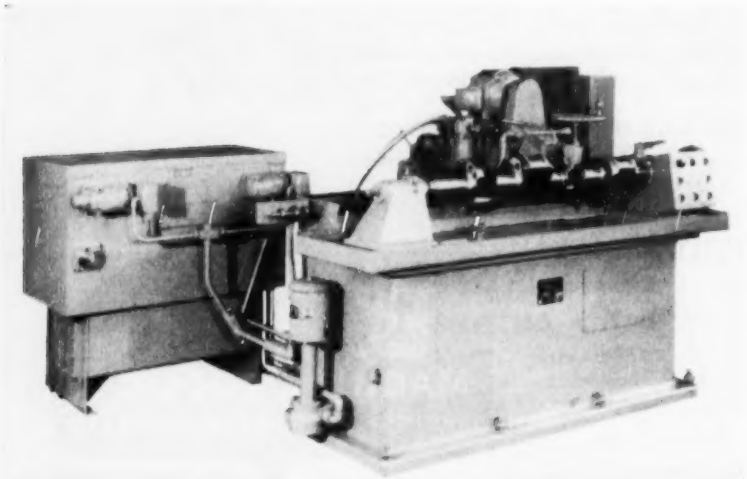


40-ton Horn Press

This 40-ton horn press has a heavy-duty frame and is easily adjusted. Unit is available either plain or geared.

Die height, table to ram, is 6 to 18 in.; diameter of shaft at main bearings is 3½ in.; bed opening is 10 x 14 in. Standard to maximum stroke is 3 to 6 in. Press operates at 50 to 100 strokes per minute.

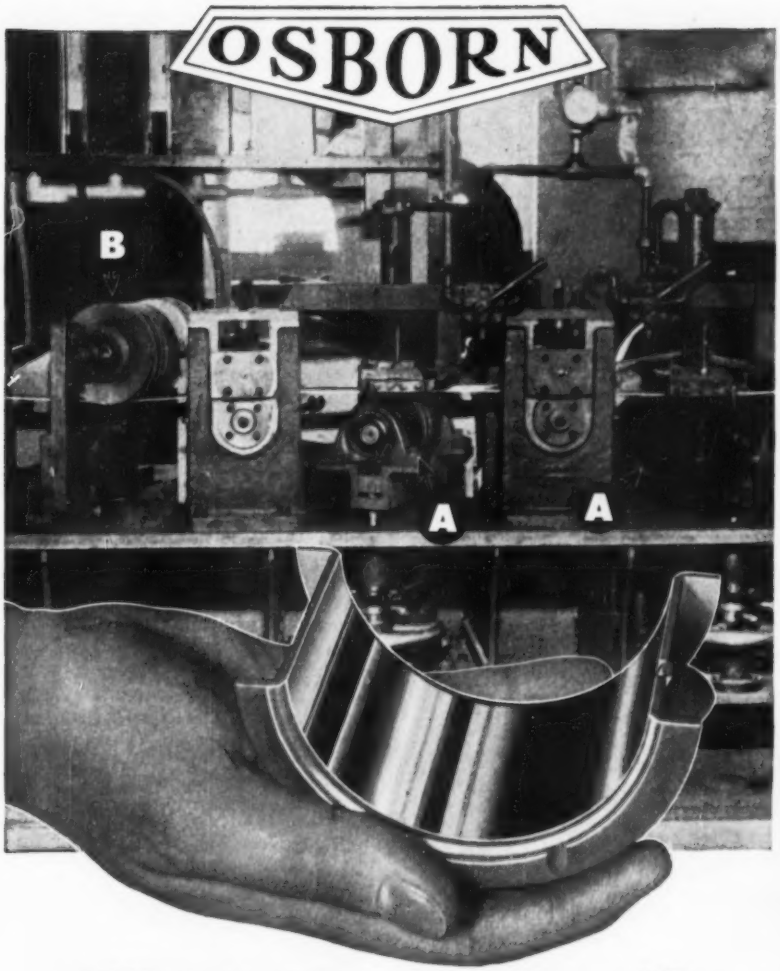
Diamond Machine Tool Co, 5111 Coffman-Pico Rd, Pico, Calif



SPOTFACING MACHINE, MR136, is one of three similar machines for drilling, reaming, and spotfacing holes in the cheeks of aircraft engine crankshafts. Crankshaft is mounted in fixture so it rotates to position for each hole. Head unit is brought to proper position by combination of manual and hydraulic controls. Operating cycle is then automatic.—*Moline Tool Co, Moline, Ill*

Open-type retaining rings measuring 3/16 of an in. and applicable to a 3/32-in.-dia shaft are available stacked on metal rods. Stacking assembly includes a specially designed cast-iron base and application tool. Rings are carbon spring steel and provide shoulders on grooved circular shafts. They replace cotter pins, screw-fastened collars, machined shoulders, nut and washer assemblies, and other fastening devices. Radially applied, units are quickly snapped into position. Designed to support heavy thrust loads, and to withstand vibrations without displacement.

Industrial Retaining Ring Co, 8 W Sidney Ave, Mount Vernon, NY



Will "automatic" ideas like these cut your costs?

THIS machine does two jobs at one time . . . does them thoroughly by power brushing . . . at the push of a button.

Perhaps a similar brushing method can help cut *your* costs, boost *your* production and improve the quality of *your* products.

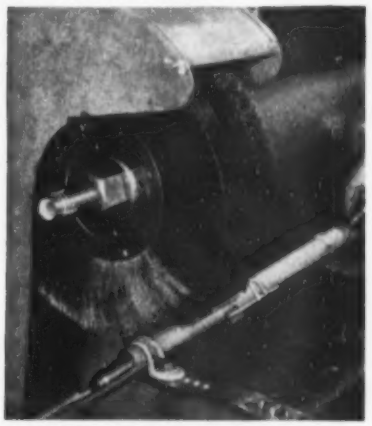
The machine developed with the help of the **O**sborn **B**rushing **A**nalyst cleans steel-backed, babbitt-lined strip for production of automotive sleeve bearings. With the strip traveling continuously, Osborn Master® Wheel Brushes (A) remove all dirt, rust and metal particles from the steel surface. Osborn Monarch® Sections (B) then thoroughly clean the babbitt side.

This is typical of the cooperation which your **O**sborn **B**rushing **A**nalyst can give *you* to solve problems of product cleaning, burr removal, roughing, polishing and finishing. For help, call or write *The Osborn Manufacturing Company, Dept. C-2, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

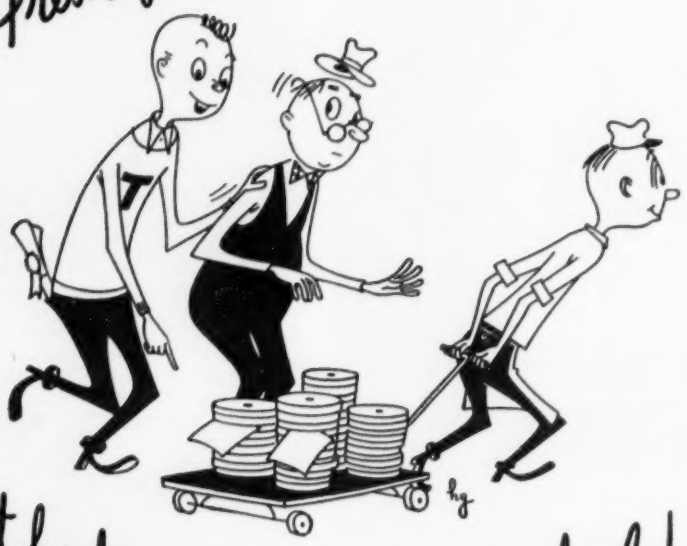
SAVES 12 MEN. This is one station of a five-station rotary automatic machine equipped with Osborn power brushes that removes burrs and sharp corners of clutch disc teeth. Formerly done by hand. Saves 12 skilled men.



9 TIMES AS FAST. This simple pipe fixture provides the means of cleaning threads of set screws. Can be applied to many cylindrical parts. Time was cut from 18 seconds to 2 seconds with this Osborn brushing idea.

10 TIMES AS FAST. This shows two gears before and after deburring by a new Osborn power brushing method. Note smooth uniform results. Time was cut from 3 minutes to 18 seconds.

Fresh from trade school . . .



but he knows his grinding wheels!

SIMONDS ABRASIVE CO.

Grinding Wheels

The right start on any grinding job is knowing the right wheels to use. Simonds Abrasive Company's complete line enables *you* to do this on all your grinding operations . . . snagging, semi-finishing or finishing . . . sharpening, cutting off or polishing.

These are high quality production tools . . . accurately specified, rigidly tested . . . backed by an established reputation for consistently superior performance . . . and supplemented by a field engineering service to meet your needs for specialized wheels.

It will pay *you* to find out about Simonds Abrasive Company products . . . and the man who can supply them. Write for name of your distributor. Also ask for free data book.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON

DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

Dietz Static Pressure Control

Cat. 101P sensitive static pressure controls are for applications where a circuit must be controlled from the exhaust side of a fan and shut down in event of fan failure.

They are an improved version of the Cat. 101 control. The new unit has a silicone-impregnated glass cloth diaphragm for operation at high or low temperatures over long periods of time.

The Henry G Dietz Co, 12-16 Astoria Blvd, Long Island City 2, NY

Temp Control Bath Machine Has Cooling and Heating Systems

This constant temp control bath machine will maintain any desired temp within ¼ F max variation. Unit has both a refrigeraton system and an electrical heating system to maintain an almost exact temp.

The machine was developed when it was discovered that the mathematical formula to correct for the coefficient of expansion was not sufficiently accurate in dealing with 0.001-in. tolerances in cylindrical aluminum parts. With two of these

units, one at the factory, and one at point of acceptance, micrometering of parts can be accomplished at exactly the same temp.

Service Metal Fabricators Co, 350 N Foothill Rd, Beverly Hills, Calif

Greaseless Polishing Composition

Acme greaseless composition developed by Hanson-Van Winkle-Munning is said to adhere strongly to the wheel face to form a heavy, fast drying head that does not fly off and remains firm in warm weather.

Abrasive particles in the buffing and polishing composition are said to be consistently sized to produce a uniform finish. For use with brushes or buffing wheels and for hand buffing, it is available in aluminum tubes and foil-lined cartons.

Hanson-Van Winkle-Munning Co, Matawan, NJ

Material-handling trays made from sheet rubber-base thermoplastic handle quantities ranging from a single piece to 300 units or more. Supports and dividers an be formed integral with the tray; many units can be used as assembly fixtures. They are lightweight, stain-, grease-, and shatter-proof. 40% rubber content makes them long-wearing and corrosion-resistant. Available in a variety of colors.

Jered Engineering & Manufacturing Co, 19800 W Eight Mile Rd, Detroit 35, Mich

Two-piece spherical washers for use in construction of jigs and fixtures are available, made of low carbon steel, precision-machined and case-hardened. All sharp edges are removed; they are zinc-plated for rust prevention. Eight sizes are stocked for use with bolts ranging from ¼- to 1-in. dia.

Reid Tool Supply Co, 709 Baker St, Muskegon Heights, Mich

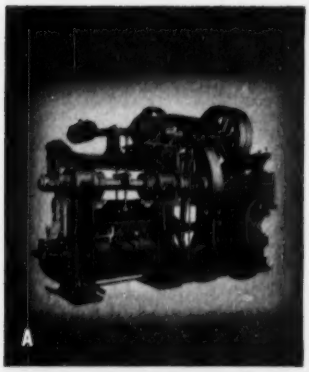
Teflon-impregnated packing has been reinforced and given greater resiliency through a new construction development. Several jackets of asbestos yarn are braided over a twisted core of glass fiber, both Teflon-treated. The packing is especially useful on high-speed centrifugal acid pumps where solid braided packing had a tendency to heat up due to lack of resiliency.

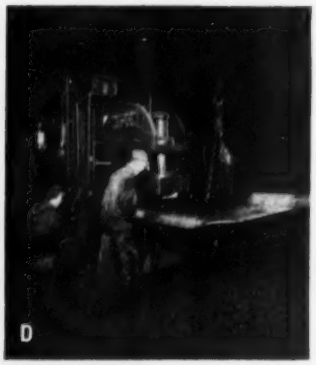
Flexrock Co, 3600-A-Filbert St, Philadelphia 4, Pa

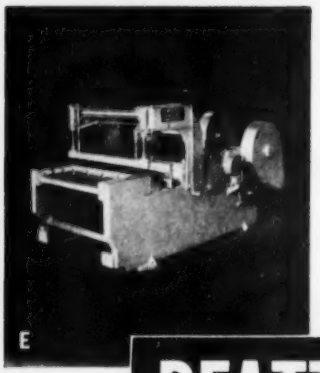
ARE YOUR PRODUCTION AND PROFITS GOING INTO THE SCRAP HEAP?
CHECK NUT
PAT.
AVAILABLE IN FOUR TYPES
REGULAR —Type A for normal supporting
INVERTED—Type B Reverse of Type A support
TEE HEAD—Type C used with sliding V-blocks
ADJUSTABLE—Type D set your own holding pressures
VLIER
VLIER ENGINEERING, INC.
4552 BEVERLY BLVD., LOS ANGELES 4, CALIFORNIA
Distributors of Spring Plungers, Spring Stops, Fixture Keys, Toggle Pads.

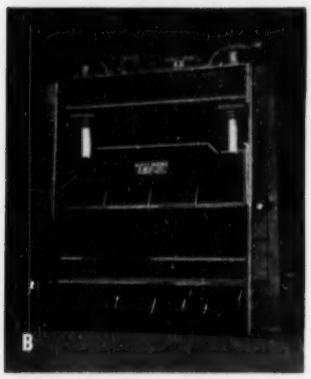
CRYSTAL-GAZER

You don't consult the occult when buying new equipment for industry. We're not fortune-tellers but we'll predict a bright future for any plant where BEATTY machines are added to the production lines. If one of the machines shown doesn't answer your particular needs, we'll design and build one that will. Call a BEATTY engineer for experienced help whenever production problems are considered.

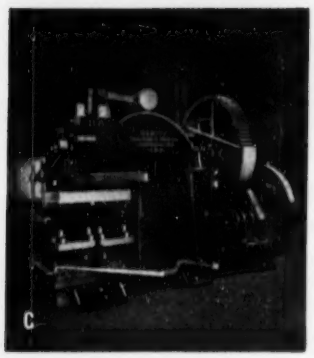








BEATTY
MACHINE & MFG. CO.
HAMMOND • INDIANA



A. BEATTY Co-Pun-Shear, one unit that does coping, punching and shearing without changing tools.

B. BEATTY Vertical Hydraulic Bulldozer for hot and cold pressing and forming of heavy metal.

C. BEATTY Heavy Duty Punch that handles steel up to 65 ft. long. Punches webs, and flanges.

D. BEATTY Press Brake and Flanger handles any type of bending, forming, flanging, pressing.

E. BEATTY Horizontal Multiple Punch for line punching of vertical flanges.

NEW BOOKS

MECHANICAL WORLD ELECTRICAL YEAR BOOK 1953 (46TH EDITION)—*Published by Emmott & Co, Ltd, 31 King St West, Manchester 3, England. 360 pages. Price 3 shillings.*

This standard handbook consists, essentially, of engineering notes, rules, tables, and data of interest and value to the electrical engineer. The new edition contains a section on electric lifts (elevators) dealing with all the equipment involved. Notes on IEE wiring regulations have been rewritten, and additional information has been added to the section dealing with control gear.

•

SAMPLING INSPECTION BY VARIABLES—*By A H Bowker, assoc prof of statistics, and H P Goode, assoc prof of mech engrg, both of Stanford University. Published by The McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, N Y 216 pages. Price $5.*

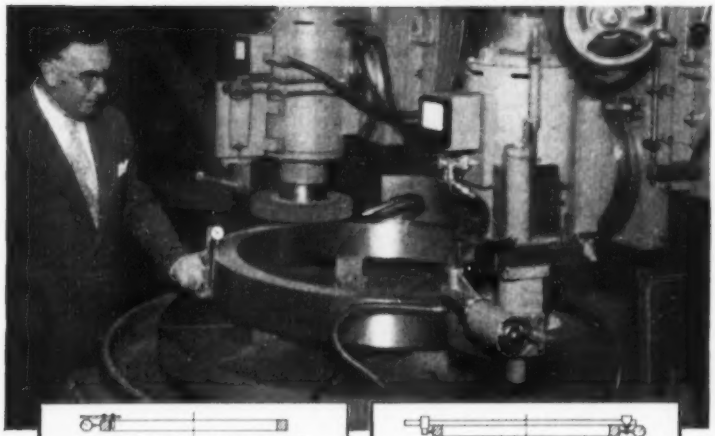
Plans for sampling inspection by variables are presented in this book, together with a complete discussion of their application, selection, installation, and operation. With the increasing emphasis being placed upon sampling by variables, this book is an important addition to the literature available on quality-control techniques.

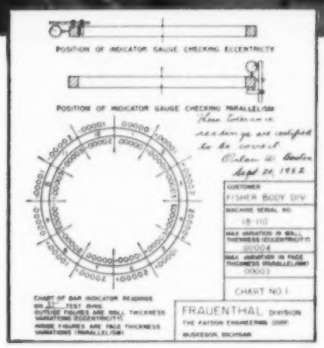
The heart of the book is a set of variables tables and their operating-characteristic curves. These were prepared at Stanford University in a project supported by the Office of Naval Research. Earlier work sponsored by The Office and carried out at Columbia University resulted in attribute tables, which were published in 1948 in *Sampling Inspection* (McGraw-Hill Book Co). The organization of *Sampling Inspection By Variables* closely parallels that of *Sampling Inspection*, and, as the earlier book contains detailed discussion of the nature of sampling plans and how they are installed, this phase of sampling is briefed in the current work. However, all essential steps in setting up a plan are given.

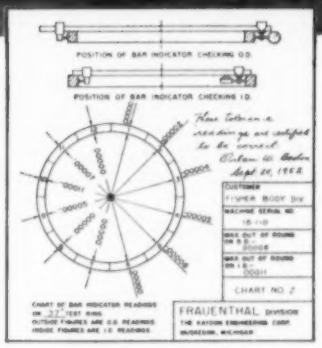
Included are plans for both a known and an unknown standard deviation, procedures for two-sided

GRINDING TO millionths*

OF AN INCH




POSITION OF INDICATOR GAUGE CHECKING ECCENTRICITY
POSITION OF INDICATOR GAUGE CHECKING PARALLELISM
CHART NO 1
FRAUENTHAL DIVISION



* *Our normal method of expressing tolerances in tenths-of-thousandths of an inch became inadequate when precision was attained to fractions of tenths-of-thousandths, expressed best in MILLIONTHS of an inch.*

Utmost precision proved by meticulous tests, and certified by Orlan W. Boston, Chairman, Department of Production Engineering, University of Michigan. He witnessed tests at Frauenthal plant in Muskegon and certified their validity on precision grinding of a 37-inch test ring, on Frauenthal Grinder No. 18-110 (shipped to Fisher Body Division for grinding tank bearings).

You get TOP PRECISION with Frauenthal Grinders

The certified readings listed at left are much closer than the 200-millionths of an inch precision specified for these machines. You can get similar results on other sizes of Frauenthal Multiple-Head Super-Precision Cylindrical Grinders, up to 140-inch diameter grinding on the Series 2200 machines. Uniformity of precision is assured in concentricity, parallelism and roundness. You can make many combination settings of grinding-spindle positions for a wide variety of simultaneous grindings of outside, inside and faces. Details on request.

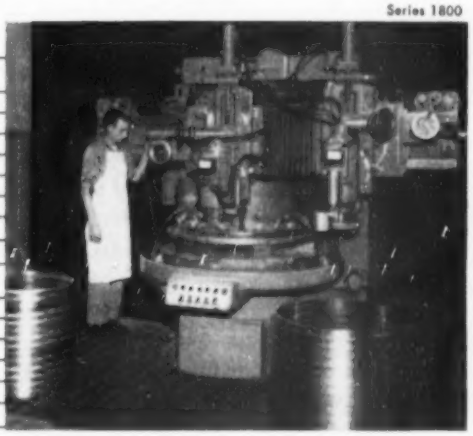
PRECISION GAUGE READINGS • CHART NO. 1

MAX. VAR. IN FACE THICKNESS (Parallelism)				MAX. VAR. IN WALL THICKNESS (Eccentricity)			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	7	.000000"	1	.000000"	7	+.000020"
2	+.000010"	8	+.000020"	2	+.000010"	8	+000010"
3	+.000030"	9	+.000030"	3	+.000020"	9	.000000"
4	+.000030"	10	+.000030"	4	+.000020"	10	−.000010"
5	+.000030"	11	+.000030"	5	+.000010"	11	−.000020"
6	+.000010"	12	+.000020"	6	+000020"	12	−.000010"
Maximum Variation in Parallelism: .000030"				Maximum Variation in Eccentricity: .000040"			

PRECISION GAUGE READINGS • CHART NO. 2

MAX. OUT-OF-ROUND ON O. D.				MAX. OUT-OF-ROUND ON I. D.			
Station	Reading	Station	Reading	Station	Reading	Station	Reading
1	.000000"	4	−.000050"	7	.000000"	10	−.000110"
2	−.000020"	5	−.000080"	8	.000000"	11	−.000070"
3	−.000040"	6	.000000"	9	−.000050"	12	.000000"
Maximum Variation, Outside Diam: .000080"				Maximum Variation, Inside Diam: .000110"			

Series 1800



What is YOUR Grinding Problem?

Through more than a decade of toolroom and production grinding, Frauenthal Grinders have been performance-proved on tough precision jobs, such as helicopters, jet engines, army and navy tanks and gunmounts, Diesel engines, machine tools, 120-inch diameter KAYDON precision bearings and similar products. We'll be glad to work with you on difficult grinding problems.

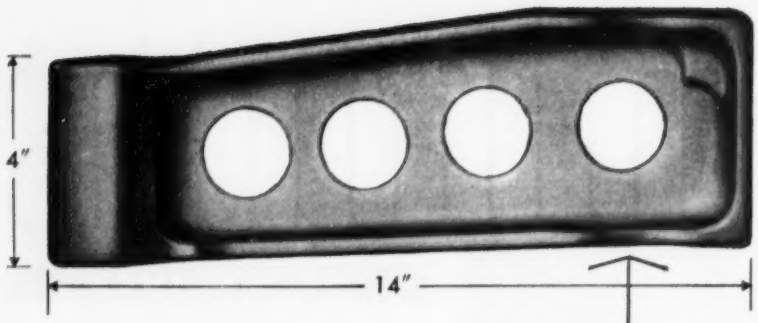
made in 10 standard sizes . . . conforming to essential J.I.C. specifications

	Series 1800				Series 2000		Series 2200			
Table sizes	30"	36"	42"	48"	60"	72"	110"	120"	130"	140"
Maximum Swing	56"	56"	56"	56"	72"	88"	120"	130"	140"	150"

Ask for Bulletin

Frauenthal Division THE KAYDON ENGINEERING CORP., MUSKEGON, MICH.

PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY



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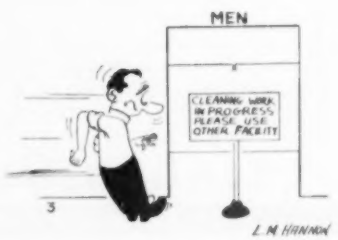
specification limits, single- and double-sampling plans, and a technique for employing both attribute and sampling plans in combination.

This book is logical, concise, and easy-to-read. All who are responsible for the administration of quality programs will want to study it and have it available for reference.

•

PLANNING AND DEVELOPING THE COMPANY ORGANIZATION STRUCTURE—*By Ernest Dale. Published by the American Management Association, 330 W 42nd St, New York 36, NY 232 pages. Price: $3 to members; $4.59 to others*

Recognizing the powerful influence that organization has upon the effectiveness of all executives, Part 1 of this book attempts to analyze major organizational problems as they arise at various stages in a company's growth. Part 2 then offers guidance for modifying existing organizational structure so they best fit the needs of the individual company and are in line with established practices as determined by a survey of a large number of outstanding industrial organizations. The book combines "rule of thumb", with systematic thinking on the problem. Prepared with the assistance (interviews and correspondence) of many well-known authorities on the subject, including Dwight D Eisenhower, Henry Ford II, Charles R Hook, and Alfred P Sloan, Jr, the book contains a great deal of information.



ROUND TABLE Discussion

CAN A MAN STEP DOWN?

Is it a reflection on the foreman when a man he has picked for his assistant must be demoted? Will he be blamed for his initial poor judgment? Will the worker be more likely to resent the demotion, or realize that he was not yet quite ready for the job? Readers' opinions vary . . .

JUST WHY ANY person should find himself up against the problem which confronts Al is certainly a question. The only reason for it would be that the foreman was a poor picker, as Al is afraid he will be considered to be by the other supervisors and his boss. Since he himself has created the problem, only he can solve it. How to do it so that everyone saves face is really a touchy matter.

Al, when he chose the individual to be his assistant, must have had some good reasons for the selection. Let us assume that the fellow was a good worker and that he had some qualifications for leadership. Suddenly Al finds himself confronted by a strange individual who is trying to kill the goose who laid the golden egg. Why? One reason which frequently is the answer is that the foreman does not give credit where credit is due, or the foreman himself is not fulfilling his job as foreman, and he knows it in his own heart but does not wish to be shown up by his assistant. So he tries to hide the abilities of the assistant.

Both of these faults lead to dissatisfaction with the individual who is working to achieve the best possible results. This feeling of being held down reacts differently with different people. In the case under discussion, the person has decided that he is going to get his just due. To accomplish this he is undermining the man who is his superior in the hope of making a big gain. Too often this method of gaining advancement prompts many others to try the same trick. It is not a policy that should be followed for a completely successful pattern in life. Yet many people have apparently gone on to bigger jobs by such methods. But are they happy? Wouldn't they rather back down if it were possible? Usually the answer is yes.

No individual can step down with-

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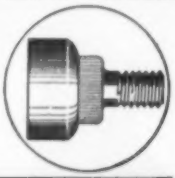
Material—Die Cast Aluminum
Production—2500 per hour
Fixture—#10 Drum dial
Equipment—#3-TR Threading machine



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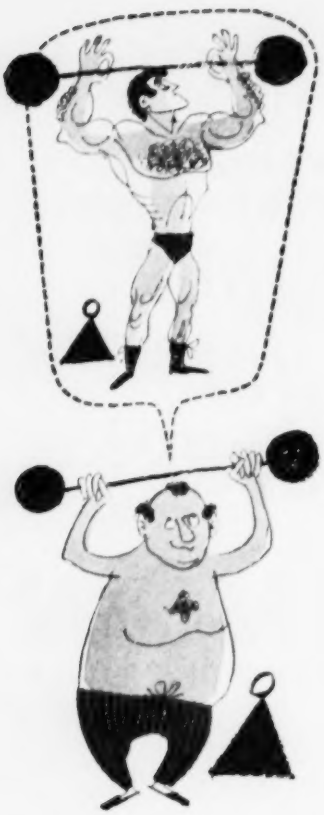

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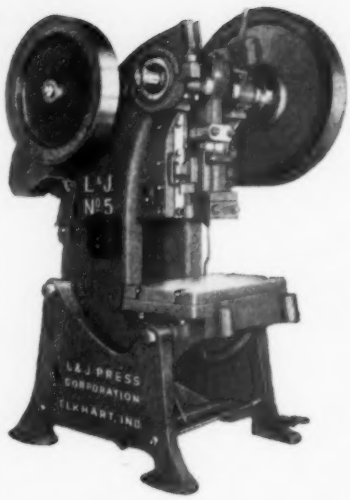
out losing face unless he himself desires to change his status. No pressure can be put on him for, in so doing, it creates a situation which brings only grief to all concerned. When situations reach the state we are discussing, not a great deal can be done except to make transfers of men at the same level. This sometimes solves problems, for a man working for one person and not getting along, may do wonders under another boss.

However, foremen know before the problem reaches this stage that a bad choice has been made and that conditions will get worse. The foreman when he first realizes this condition, should take the time to set his own thinking right as well as that of his assistant. A foreman must be a leader and in order to lead, he must really train others. However, in order to properly train, he must know how. So again we come to the fact that our foremen need leadership, too. Many think that they know all there is to being a foreman, yet they fail to handle such situations as this adequately.

Companies who have tried to train individuals and tried to help foremen find that there are strange attitudes prevalent among the lower supervisors. Yet, just because a few men do not feel that they want to learn, no company should take the attitude that they will stop trying to make better supervisors out or their men.

One last word regarding demotions. If and when it is necessary to make such moves, and at certain times they do become a necessity, remember one thing. Always handle the problem as you would want the problem handled if *you* were to be on the receiving end. Try to analyze what effect it will have on you and the company. Try to place all the cards on the table. Admit it, if you

"I told her I lost a hand on the lathe. Don't know what's so horrible about one of the men quitting."



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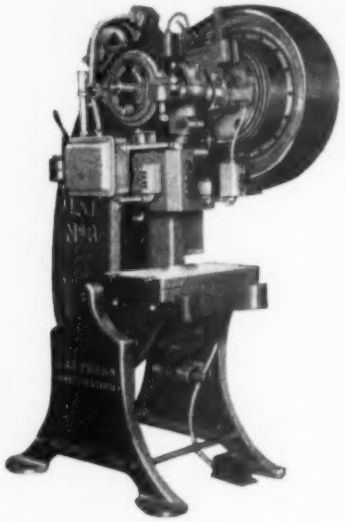

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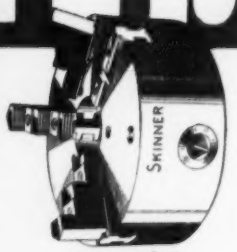

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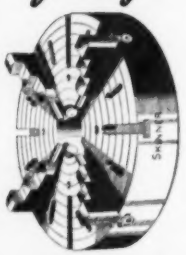

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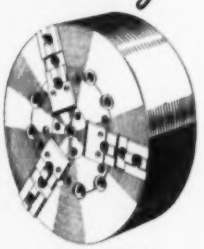

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INDEPENDENT CHUCKS Models for medium and heavy duty tool room and general machine shop work. Available in sizes from 4½" to 36" with semi-steel, steel, or forged steel bodies. All other parts are heat-treated alloy steel. Jaws are solid reversible or two-piece with reversible tops for either internal or external gripping. The body surrounds more than 60% of each operating screw for the full length of the screw to assure proper alignment at all times.

AIR & POWER CHUCKS Self-centering models for heavy duty production work on engine and turret lathes and automatics. Sizes from 6" to 24" with forged steel bodies, and with either 2 or 3 jaws are available. The wedge angle is such that work is gripped positively regardless of jaw position. The chuck will not release the work, even if air line is broken, until operator actuates draw bar. Skinner also has a complete line of power chucking accessories.

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Details on the full line of products are included in Skinner General Catalog — write to the company or your nearest Skinner distributor for a free copy!

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Chucks - Vises

are wrong, and in the future be very cautious in making your selections. Try to study your workers and rate them several different ways before advancing them to positions which might lead to situations like this. Remember always that you yourself would not like to receive a demotion so why make it inevitable for the other fellow.

Charles D Townsend
West Hartford 7, Conn

•

FORCING A MAN to step down is a very serious matter, but so-called strong high brass are recommending it every day, thereby thinking they are doing their company a great favor. In reality, they are often practising the law of the jungle to promote their own interests.

Some executives think when they are forcing a man to step down that it is an act of survival of the fittest.

I have seen many cases during my life as an executive, where it would be more proper to discharge the man recommending a step down for his fellow executive or his assistant, than it would be to accept the step down as Ed suggests. Demoting a man should be considered twice before executed.

I wonder if Al is giving the real reason when he says that Bingham is working his crowbar to get himself in. As no details are given in the case it seems to me that Al is accusing Bingham of something that he only thinks he is doing. If that is so, it tastes very much like nazi or communist methods, which are unworthy of any foreman in a democratic country. Perhaps Ed is looking for a chance to show management that he is a strong man, too. He might also try to cover his own weakness. But I don't think management will accept either Bingham's crowbar or Ed's non-evident conclusions.

"I saw the president giving the vice president hell this morning, so I guess it'll get down to us in a few days."

Here are just two of the big pages from the new Yale Hoist Book

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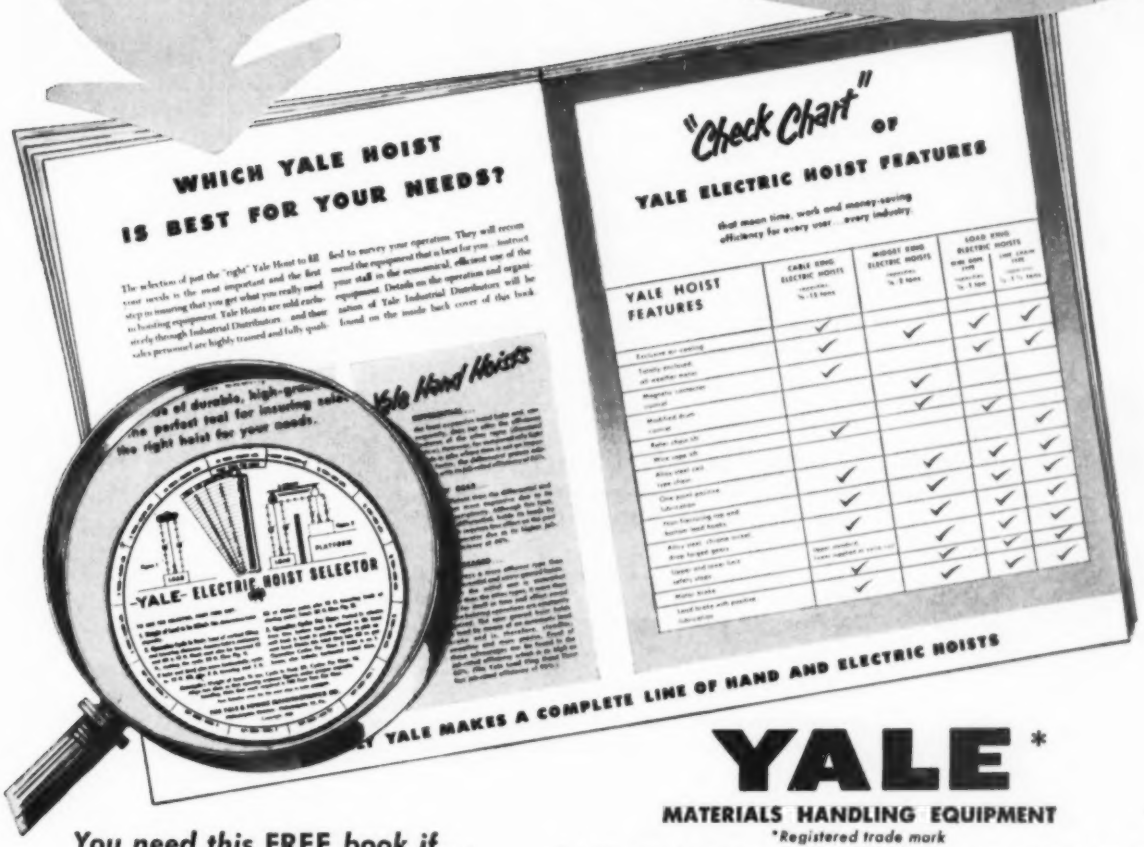
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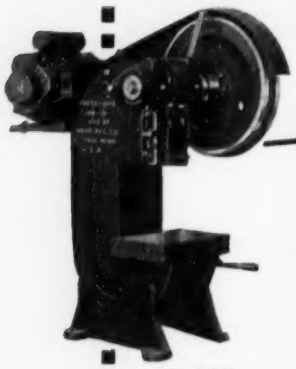

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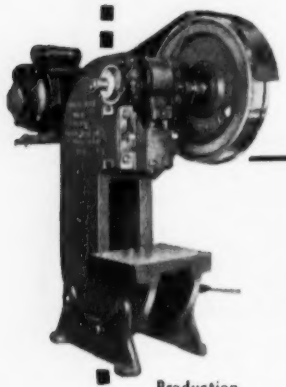

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If Bingham is using unfair methods to get promoted, he'll ruin his chances rather than favoring them. In that case his own methods might be turned against him so that he rightly is stepped down. Ed should know, however, that it is much more difficult to step down a man than it is to promote him. Under a hard manager, Al might get credit for stepping down everybody he is able to find fault with.

Several months ago I was sent to a jobbing shop employing about 100 hands to advise the manager what steps should be taken to better their production results. I was told by him that there were several staff members that ought to be fired, as they didn't do their work the way they should. After I had investigated the conditions under which they worked, I came to the conclusion that it was their very mixed production that gave the company poor economy, and I gave my recommendations accordingly.

Stepping down anybody raises a lot of complications; the man demoted will never again be the same as before, and it creates a lot of unrest both among executives and men. I think, therefore, it is better for a man to leave the company rather than be demoted by somebody who didn't appreciate his services.

When some of the boys hinted that Bingham didn't shoot square, Al should have asked them casually what was the matter. If Bingham then flagged, he would probably be more careful in the future. If he didn't flag, Al should try to go to the bottom of the case. If he then found evidences of the accusation, he should put his cards on the table before the superintendent. This would prove nothing against Al being a bum picker, because Bingham

might be a good foreman or assistant, except that his moral code was too low, and Al could not possibly be held responsible for something he did not know.

A E Fristedt
Stockholm-Bromma, Sweden

•

SHOULD BINGHAM be fired for his lack of loyalty or demoted to his former job? I'm sure I don't know, and I'm sure that no one else would either without having more information.

I have noticed an increasing tendency for more and more people to look for rules and regulations to govern their conduct and actions, no matter what the situation might be. No one can set up inviolate rules to cover this sort of predicament. One Bingham should be fired, another demoted, another reasoned with, another educated, and another reprimanded. There are as many correct solutions to this problem as there are Binghams.

In the case at hand, certainly Bingham should have received instructions as to the limits of his authority and given some ideas on the loyalty due to his superiors and to his company. Given this indoctrination, there can be no excuse for his actions. If not given, then Al deserves a little raking over the coals himself.

In either case, an offer should be made to demote Bingham to his previous job under the condition that he perform as capably as previously. The workmanship that earned him a promotion must certainly be good enough so that he will be a valued employee if he can prove to be man enough to take the demotion.

R E Moulton
Huntington Park, Calif

•

COLOR BLIND

I AM INCLINED to agree with Ed that there is a definite need for color in the machine shop, or any shop where machines play a part in production. But when the shop owner or the purchasing agent is in the market for a machine, the question of color seldom is raised, unless it be the ability of the machine to get the buyer out of the red and into the black.

Yet the fact remains that you and I, when we visit another plant, get a visual reaction in which color plays an important part. Even if we are color blind in actuality, we can appreciate the exterior layout

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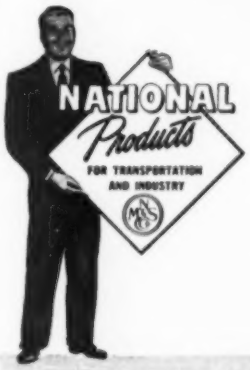

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Steel Type (Standard) 6
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Symbol Stamps (Standard) 5
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Type Holders (Special) 10
Type Holders (Standard) 6

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FRANKLIN AVENUE • HARTFORD, CONNECTICUT
by Parker

of a modern plant where there is a well-kept lawn in front of the office and perhaps a few trees or shrubs planted where they can soften the severity of brick, concrete and glass. But usually this concession to color ends when we enter the plant proper; as a rule the machines run to one color onlyt—he usual battleship gray, streaked with black and amber oil-stains.

I have heard it said over and over by machine tool salesmen that the question of color is never raised by their customers, but they would gladly cooperate in any color scheme at no extra charge. This then would seem to indicate an almost complete lack of interest in color values on the part of the machine tool purchaser.

Frankly, I don't believe this is so. Down through the years machine tool advertising has conditioned the buyer to look at the machine from one angle only — performance. Granted the fact that a machine must produce in order to justify its presence in the shop, it would be difficult with the advertiser's emphasis on performance — the ability to turn out consistently so many pieces per hour. Nor can anyone object to the advertiser stressing lessened operator-fatigue by refinements in design that make for easier handling. Why not, then, have the brains of the advertising industry direct its attention toward another selling point—color? I am sure a very good case could be made for further lessening operator fatigue due to eyestrain by painting control levers in contrasting colors. A little experimenting would soon evolve a color scheme that would alleviate much of the eye-fatigue that plagues the machine operator at the close of a busy day.

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High-speed automatics take full advantage of the cost-cutting qualities of Republic Bars. Designers can make full use of the high strength and uniform structure of these cold drawn bars. Production men can get the ideal combination of wearability and strength out of the uniform hardenability and toughness of the alloy steel.

And . . . Republic 3-Dimension Metallurgical Service focuses the experience of our Field, Mill, and Laboratory metallurgists on your production problems for the best answer with Republic Cold Drawn Alloy Steel Bars.

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Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

—which I gratefully acknowledge has made micrometers and other small tools easier to read—could be used with eye-benefit and increased accuracy on lathe and milling machine. Any machinst knows how troublesome reflected light can be when setting a cross-feed screw to the zero mark, particularly when the numbered dial has seen much service. Again, speaking of color, some of the oil-resistant plastics could be used with advantage here. For instance, a dark blue dial with white figures might even be easier on the eyes than chrome-finished steel. Anything that adds to an operator's comfort while at the machine is bound to reflect favorably in the quality and quantity of his work.

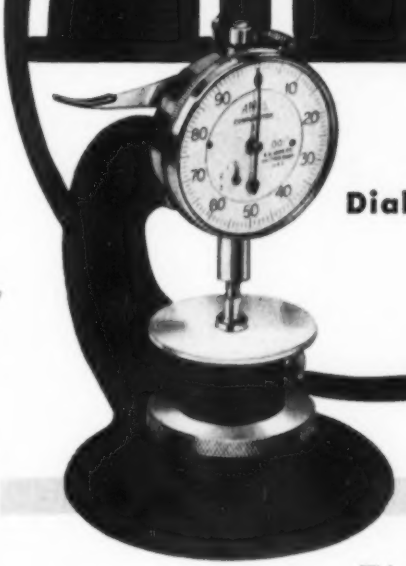
Color is used in the home to make the place more livable—in short, as a tool to achieve a definite purpose—the promotion of well-being. When you consider that we spend the best part of our waking hours in the shop and that well-being is just as essential if we are to put forth our best efforts in the business of making a living, then we must admit that color as a tool to increase our working potential has been sadly neglected.

Maybe the day is not far distant when prospective purchasers at the annual Machine Tool Show may overhear a conversation such as this, "What do you think of that new Ajax miller, Joe?"

"Well, frankly, Mac, I think they have a good piece of equipment there if it weren't for their color styling. I think the Zeus people have just as good a machine, with better color harmony—I'm afraid my people aren't the Ajax type."

"How long does it take a self-tapping screw to start working?"

AMES



No. 2
Dial Comparator

This is smallest in the Ames' line of high quality dial comparators and it is ideal for desk or bench use in the fine inspection of small precision parts. It is light in weight, but its broad base makes it very stable. The capacity approximates that of the regularly supplied Ames No. 202 Dial Indicator which has a dial numbered 0-100, graduated in .001" and with a .250" range. Should your job requirements differ, you can have the No. 2 with any Ames "Hundred Series" Dial Indicator. Send for Ames Catalog No. 58 covering the entire line of Ames Top Quality measuring instruments or, better still, send complete details of your Quality Control problem. Ames will suggest a solution – no obligation, of course.

Ames Long Range Dial Indicator No. 2822

Ames Dial Micrometer No. 516

Ames Dial Comparator No. 130

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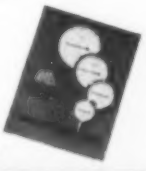

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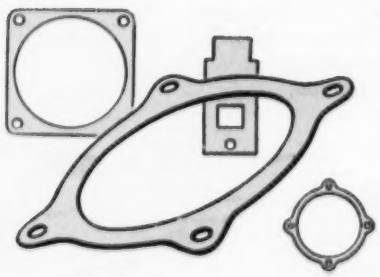

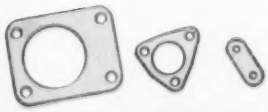

SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

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"You may be right at that, Joe, but I was talking to the Ajax salesman and he tells me they've done a lot of experimenting on this new model — what he calls spectrum analysis. They had a crew running their machine for specified periods with different color combinations to get their reaction. They claim this blend of color styling upped production 5%. It might be sales talk y'know, but then again they might have something."

R S Alexander
Greenville, RI

•

COLORS ARE BECOMING the showmanship of business. Automobile manufacturers who started with one or two colors now give us every color under the sun. New oil burners come in many colors and many other household appliances are painted in eye catching shades. The most colorful show or display windows draw the most customers. The movies and many other industries are going for colors in a big way. Why not machine manufacturers?

Colors make the shop lighter and brighter and are especially appreciated by women workers. The lighter colors suggest keeping machines clean, and a cleaner shop is a safer place to work. Colors are more attractive to visitors and are less strain on the eyes.

It is my opinion that the machine manufacturers will some day change the colors of new machinery as radically as the automobile manufacturers. We all like blue skies and green grass with beautiful flowers sandwiched in between. Why wouldn't we like colorful paint jobs on machinery?

A E Salmons
Philadelphia, Pa

•

COLOR PAINTING (color dynamics), lighting, worker morale and orderly arrangement are so interdependent upon one another that it is difficult to draw a line of demarcation. Without color and light, morale cannot be good, and low morale means lower productivity and disorderly arrangement.

I know of no case where the new ideas about color and lighting have been adopted which did not result in increased output. We have some very hard-headed executives in the British engineering industry who are difficult to convince that such frivolity as colored paint can have a direct bearing on ouptut. In all

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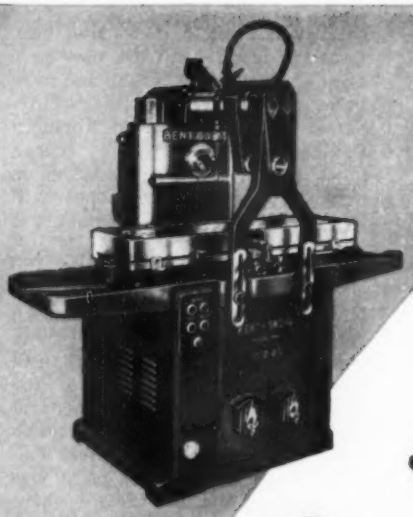
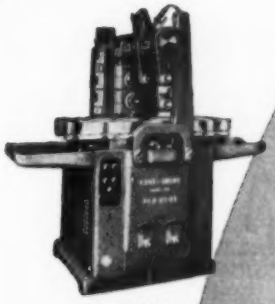
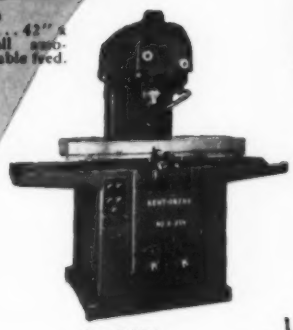
Do your milling jobs *right*—with Kent-Owens Milling Machines! Designed with advanced features that mean outstanding *speed, accuracy* and *dependability*... Ruggedly constructed to maintain accuracy under hard use. Twin-post head mounting—an exclusive Kent-Owens feature—assures balanced load, no chattering. Simple in design and operation. Saves labor... reduces costs! Write for bulletins on wide range of hydraulic and hand-operated machines. Kent-Owens Machine Co., Toledo, Ohio.



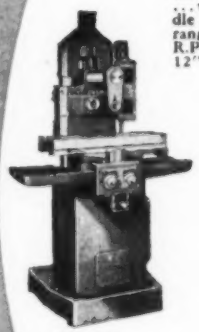
No. 2-20.
20" table travel... 42" x 12" table... full automatic hydraulic table feed.



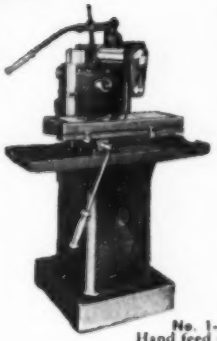
No. 2-20D.
Double Spindle for two milling operations at same time... 20" table travel... 42" x 12" table.



No. 2-20V.
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M.... 42" x 12" table.



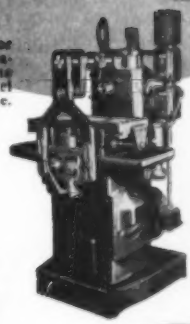
No. 1-V.
Hydraulic vertical head feed... 5½" head travel... 25" x 9" table.



No. 1-M.
Hand feed to table and head... 25" x 9" table... Adjustable head counter-balance.

No. 1-1401.
Double Spindle for two milling operations at same time... 14" table travel... 32" x 9" table.

No. 1-14.
32" x 9" table... 14" table travel... hydraulic table feed... full automatic cycle.



No. 1-8.
8" table travel... 25" x 9" table... automatic hydraulic table feed.

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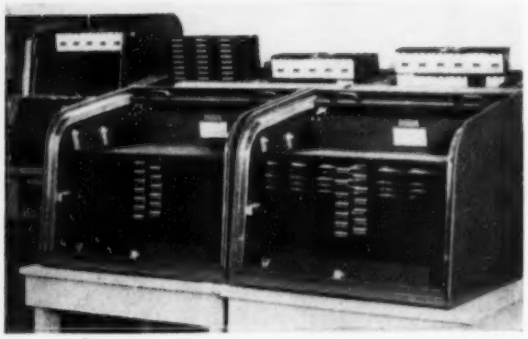
How McCaskey Gage and Tool Inspection Control has helped achieve:

HIGH QUALITY CONTROL STANDARDS in RECORD TIME in NEW AVCO PLANT

AVCO'S Bridgeport-Lycoming Division achieved high standards of Quality Control in their new plant in a very few months. The simplicity and effectiveness of McCaskey Control procedures were readily adapted to their needs and have played an important part in their entire program.



The following facts concerning it are taken from "Maximum Tool-and-Gage Control" by Harry M. Baldwin, General Foreman, Quality Control, Bridgeport-Lycoming Division, AVCO Manufacturing Corporation, Stratford, Conn. The article appeared in a recent issue of "Factory Management and Maintenance."

Their objectives were first, to place control of gages, tools and instruments in the department responsible for inspection of them, centralizing records and inspection. Second, to use a minimum of forms and filing equipment.

Their accomplishments in less than a year include:

. . . effective centralized control. No gages or measuring instruments out of tolerance are being used.

. . . low initial outlay for McCaskey visible clip-spring wall boards and cabinets with capacity available for growth to twice the items now handled.

. . . minimum paperwork and, as a result, low unit cost of control.

. . . rapid accumulation of information on history record cards from gage tags and other sources for dependable guidance in planning future activities.

Similar results can be accomplished in your plant with McCaskey Controls. You can adapt them to your requirements, as AVCO and numerous others, large and small, have done.

Let us send you Mr. Baldwin's complete article and additional information on McCaskey Gage and Tool Control. Our Industrial Specialists are available to work with you. They are well qualified through practical experience to offer constructive suggestions. No obligation of course.

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Please send me the AVCO Bridgeport-Lycoming article reprinted from "Factory" and additional information on McCaskey Gage and Tool Control.

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cases where these men have been forced to adopt such frills, they have been amazed at the results and have become converts to the idea of dynamic coloring. The old Northern England saying, "Where there's muck there's money," has taken on a new meaning: "The money will only be found when the muck has been cleared away."

The demands for color, light and cleanliness in engineering shops have not arisen because modern workers are fastidious or fussy about their surroundings, but have been the inevitable result of the high precision work now turned out in machine shops. Those of us who are old enough can remember machine shops where black paint was the standard machine finish, where th efloor was composed of black foundry sand and where the lights were left on all day and every day without much benefit to the general level of illumination. Imagine trying to produce diesel engine fuel injection gear or radar components under such conditions! It would be impossible.

Color and lighting are the first things to be tackled when it is desired to increase the output of a machine shop. Since the new ideas about color in workshops have originated from industrial psychologists, it is essential that expert opinion be taken from such people before a single paint brush is wet. It is useless to just specify a light color and splash this on walls and ceilings in an indiscriminate manner, and then expect an immediate jump in output. After all, whitewashed walls are the oldest machine shop enclosure in existence but it cannot be claimed that the old shops were palaces of peace, harmony and prosperity.

"I took the boss home for dinner last night and he's raised my salary—so I can eat out!"

A color scheme must be designed to suit the individual building conditions and the type of work which is performed therein. A department which deals predominantly with brass and bronze calls for a color scheme different from that of a department working in steel or aluminum alloy. In fact, a complete factory must be broken down into sections when designing a color scheme.

Other factors which affect the color are the amount of daylight available and the direction from which it comes. Ceiling heights are very important, as the wrong color in a low-ceiling working area can cause acute claustrophobia and depression in the workers.

The effect of color upon human beings is surprisingly potent. It has been found that strong yellows, for instance, can produce nausea in people who have to work with masses of it. If a high-temperature working place is painted red, then the workers will complain of heat exhaustion. Similarly, green will, in some cases, lower the apparent temperature of a working space and will cause excessive fuel consumption for heating.

Lighting and color in workshops are tied up with one another; it is a waste of time and effort to design a scheme of color for daylight only, when a night shift is employed constantly and has to work under artificial light. Good lighting is generally thought to mean packing the maximum watts into the smallest area. Lighting is more subtle than that. The reflecting powers of the material being worked must be considered and the bad effects of

"Sometimes the boys like to Indian-wrestle during rest periods."

From the Beale Collection of Early Americana

Horseshoe Iron... to Aircraft Steel

Ryerson Completes 110 Years of Service

When Joseph Ryerson opened his first small iron store, 110 years ago, the clang of the blacksmith's anvil was a dominant note in America's metal-working industry. Blacksmiths, boilermakers and other metalworking pioneers were the iron store's first customers. Their orders for horseshoe and boiler iron, axles, plow steel, spikes, etc. formed the basis of our business.

Today that small iron store has grown to be the world's largest steel service organization with fifteen great plants strategically located across the nation.

On the occasion of our 110th Anniversary, we are grateful for our thousands of customers whose orders through the years testify to the Ryerson tradition of trustworthy service. And we are thankful for the privilege of living and working in a free country where initiative and service are rewarded.

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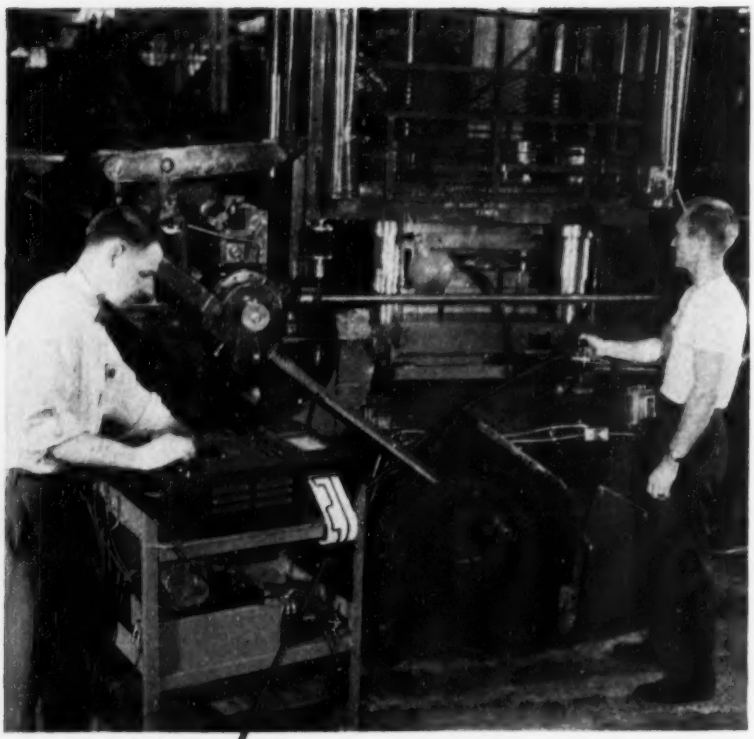

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with Brush Recording Analyzer

Here, in the plant of a large manufacturer of automotive parts, periodic checks are made on this 150-ton mechanical press to spot possible overloading. With resistance-type strain gages mounted on the press, the signal is amplified and recorded by the Brush Strain Analyzer... producing an *immediate chart record* of press strain.

Since measurements can be made quickly and easily, the Brush Strain Analyzer furnishes a *practical method* of detecting overloading and avoiding costly breakdowns, and lengthening press life.

You can use Brush Recording Analyzers to save time and solve problems... in measurement of strain, torque, vibration, pressure, d-c or a-c voltages or currents, and other variables. Brush representatives are located throughout the United States. In Canada: A. C. Wickman, Limited, Toronto. For bulletin write Brush Electronics Company, Dept. U-2, 3405 Perkins Avenue, Cleveland 14, Ohio.

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glare must be guarded against constantly. Glare is one of the major causes of worker fatigue and is always caused by badly placed lighting of the wrong power.

If we accept the idea that it is better for employees to be happy and contented, then color and light will go a long way to achieve this aim. It has been found that workshops can be made so attractive that the employee looks forward to entering the plant instead of dragging himself there unwillingly. In some countries which have a lower standard of home life than that of the USA, investigations show that the modern colorful plant was more attractive to the worker than his own home.

Once color and lighting in a plant have been improved, a general all-round tightening up of order and cleanliness follows automatically. Dirt and disorder stand out clearly, because for the first time it can be seen clearly and remedial steps are taken immediately to improve the condition. One works manager who was converted against his will to color dynamics said to me, "For the first time in years, I now know where everything is. I suppose it's because I can see everything distinctly."

Clifford T Bower
London, England

•

COLOR? WHAT IS color? According to one dictionary, color is defined as "the sensation produced in the eye by rays of decomposed light." Another and more easily understood definition is, "that element which makes things visible."

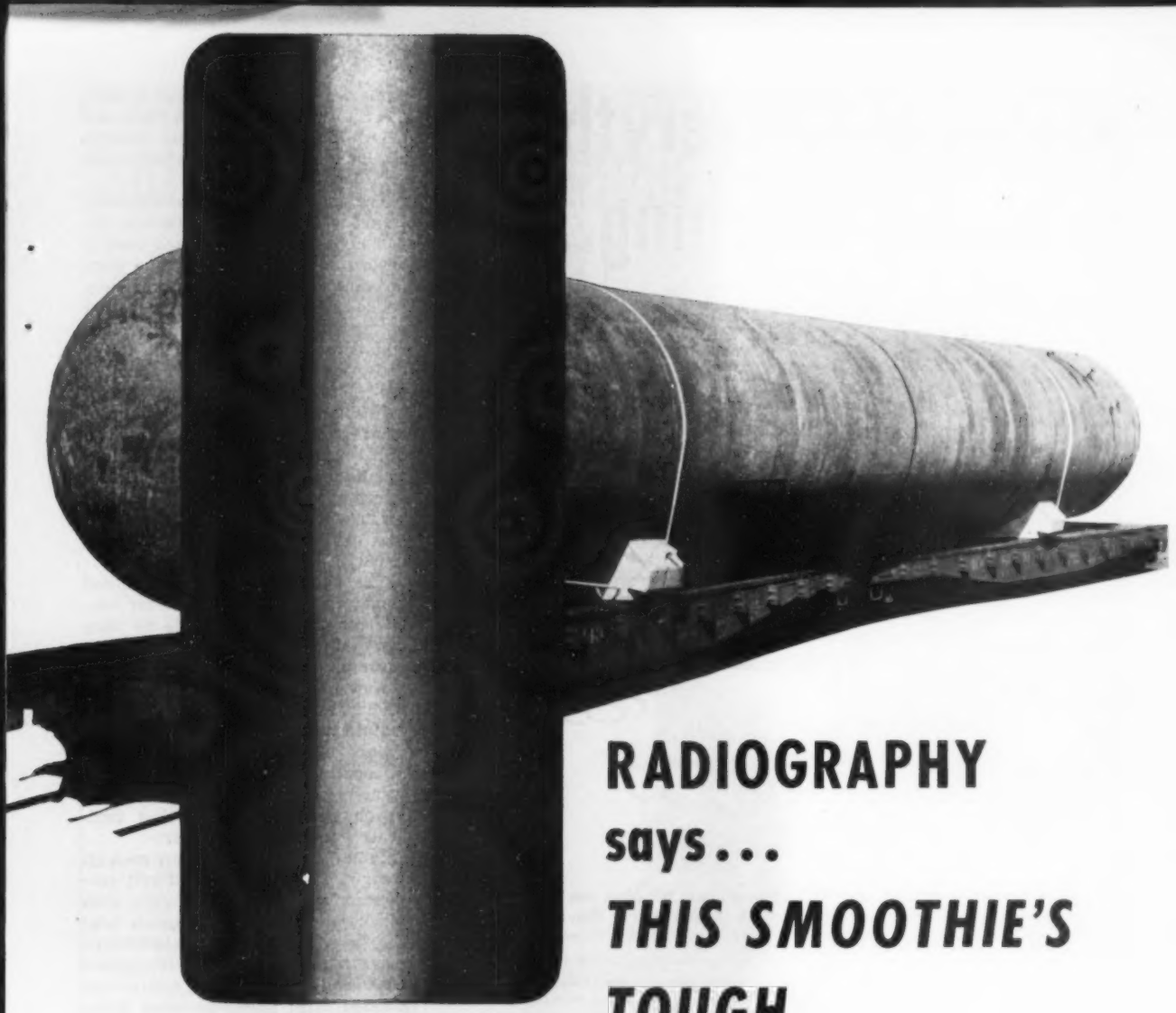
There are great differences in light intensities, hence, some colors are more visible than others.

The reasons for marking with different colors are several. One is safety, another is to avoid errors, and a third makes a plant more convenient in many ways.

The simple marking upon a shop floor with 3-in.-wide stripes at the sides or limits of certain areas, such as aisles, has been of great benefit in overcoming carelessness upon the part of truckers in a shop. In addition, it is a safety measure to prevent people from stumbling over objects.

There is a plant in a midwestern state where color designations are profusely and thoroughly applied and the claim is made that this is a very good investment because of the time saved by the employees.

In this plant, all supporting col-



RADIOGRAPHY says... *THIS SMOOTHIE'S TOUGH*

This 90-ft. pressure vessel looks smooth, clean, and neat. But that's not all that welding did for it. It helped make the tank strong and tough with less weight and at lower cost.

Designers of pressure vessels can take full advantage of the welding process because each weld can be proved sound by radiography.

This is how radiography widens the opportunities for welders—why it can increase your business.

Wouldn't you like to know more about how it can help you? Get in touch with your x-ray dealer and talk it over.

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NAME_____ ADDRESS_____

CITY_____ STATE_____

umns are painted white (no luster) down to within 5 ft of the floor, and below this height, they are painted a color to match the walls and doors of a department.

The checker of castings which go from the foundry to a particular department just touches each casting with a colored crayon, so, no matter how ignorant the trucker may be, he knows that all castings spotted with a specific color go to the place where the machines and the lower ends of the columns are painted that color.

In this same plant all 440-v equipment and conduits are painted a dull black with 2-in red stripes around conduits every 10 ft; all 220-v conduit and wiring are painted black with collars 6 in. long of yellow, while all 110-v equipment is red with white colors.

The sprinkler system is painted bright red. Handles on motor controllers are painted white so they can easily be identified even in dark corners.

Now here is one which is seldom found, and that is to dress the maintenance men in distinctive types of clothing. All janitors, sweepers, and unskilled workmen wear regulation trousers of any color or kind of material, but their coats and caps are white.

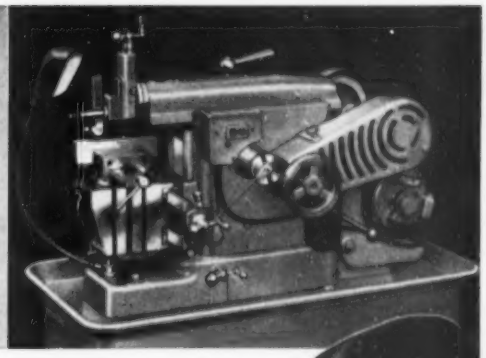
Police, firemen, and safety men all wear the usual blue uniform; carpenters wear overall trousers with black jackets and caps which bear the word "carpenter;" electricians wear regular trousers with brown coats and yellow lapels and yellow banded caps; plumbers wear green outfits throughout.

There is one great advantage and that is that anyone from the brass on down, or on an outsider, can spot a man according to his trade, and in an emergency, this is a great help because of its saving in time in cases such as a fire, the hurried need for

"Be careful, Jackson, that's the second time this week you've hooked up the foreman's hearing aid."

South Bend 7" Shaper

FAST · EFFICIENT · ECONOMICAL!

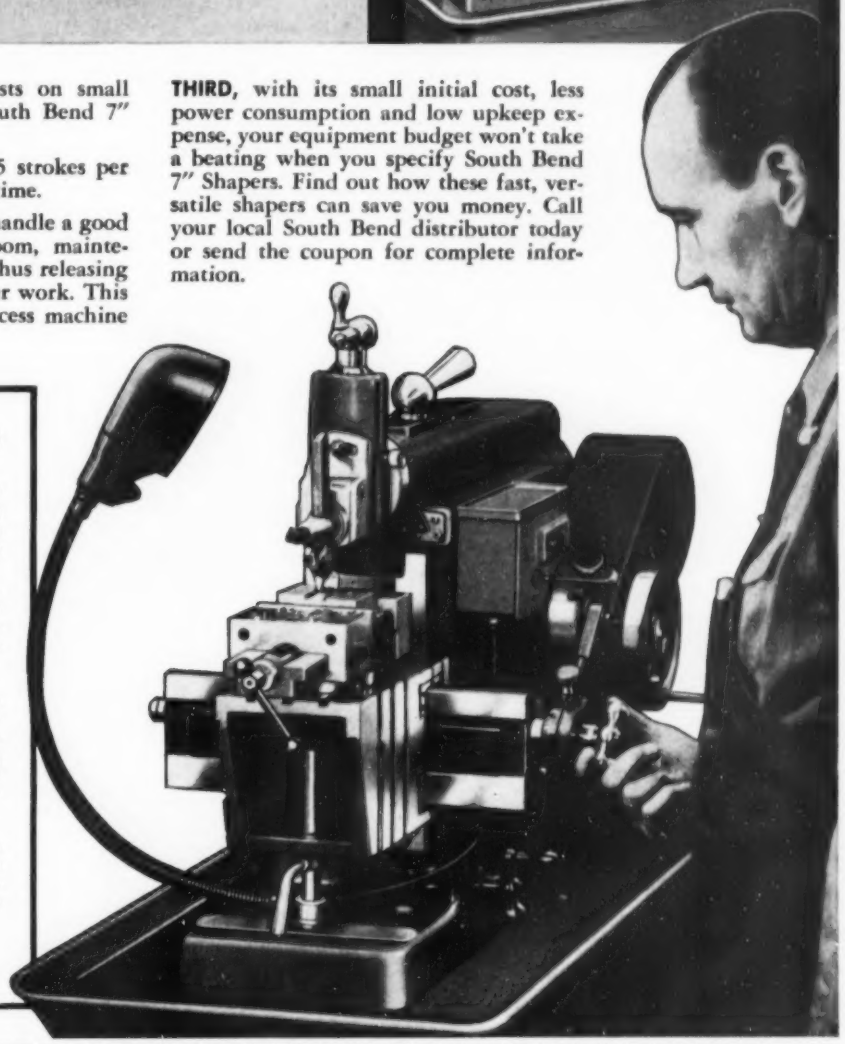


Watch your machining costs on small work go down when a South Bend 7" Shaper takes over.

FIRST, its speed — 42 to 195 strokes per minute reduces machining time.

SECOND, its 7" stroke will handle a good share of your small toolroom, maintenance and production jobs thus releasing your heavy shapers for larger work. This stops the waste of using excess machine capacity on small jobs.

THIRD, with its small initial cost, less power consumption and low upkeep expense, your equipment budget won't take a beating when you specify South Bend 7" Shapers. Find out how these fast, versatile shapers can save you money. Call your local South Bend distributor today or send the coupon for complete information.



SPECIFICATIONS

RAM

Stroke length . . . . . 0 to 7"
Strokes per min. (4) . . . 42 to 195
Cutting speeds . . . 3 to 114 feet per minute

TOOL HEAD

Vertical travel . . . . . 3"
Tool post slot . . . . . ⅜" x ⅞"
Head swivels . . . . . 360°
Clapper swivels . . . . . 35°

TABLE

Vertical travel . . . . . 5"
Horizontal travel . . . . . 9½"
Power cross feeds (6) . . . . . .002" to .012" (reversible)
Size . . . . . 6 3/16" x 5" x 5¾"
Distance from ram . . . ½" to 5½"

VISE

Maximum opening . . . . . 4"
Jaw width . . . . . 4"
Jaw depth . . . . . 1"
Height over table . . . . . 2 11/16"

MOTOR

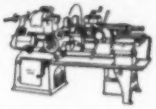
⅓ or ½ h.p.

SEND INFORMATION CHECKED:

☐ _____

☐ TOOLS & ATTACHMENTS

☐ 9" and 10" BENCH LATHES



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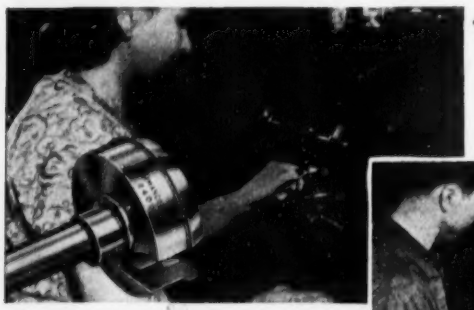
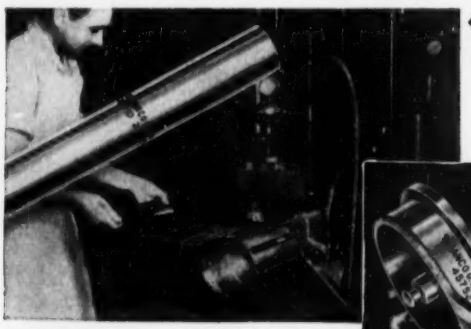


SERIES 50 — Noblewest general purpose marking machine with full pneumatic operation. Can be tooled for marking flat and round surfaces, for precision graduating and for serial numbering with Noblewest automatic numbering heads.

SERIES 20 — This rapid precision marking machine will permanently mark up to 5,000 pieces per hour. Ideal for parts that will stand up and rotate on the carrier dial. Three interchangeable pressure dials mark approximately 50 different parts on this one Noblewest machine.



SERIES 19 — Has production of 6000 pieces marked per hour. The die holder on this model has automatic pressure compensator for insuring uniform depth of markings regardless of slight variation of part sizes.

SERIES 21 — A Noblewest rapid production marking machine with a capacity of 2500 to 3500 pieces per hour. Ideal for parts on which markings must be accurately positioned.

new lights or bulbs, burst pipes and others.

The firm had lighting experts come there and these men worked out color schemes for walls, screens, machines not otherwise marked, and, probably the firm's accident rate is very low. All of this has had a good effect.

Robert Lee Grayford
Worcester, NY

•

AESTHETIC ASPECTS of factory design, including color for plant and machinery, are deservedly receiving increasing attention. Factory workers spend a greater portion of their total working hours in the factory workplace than they do in any other place. For many of them, a home is a place to sleep, obtain meals, and perhaps spend a few hours relaxing. Various amusements, as well as travel for business or pleasure, scatter the remainder of the worker's time over many different locations.

As the factory is the one place of which workers are conscious for many hours day in and day out, it is only logical that conditions should be as pleasant as possible in order to foster a friendly, cheerful, and vigorous morale. Many of the factory services such as employee facilities and lighting, are primarily and directly designed to make the working atmosphere as pleasant as possible. Proper aesthetic design and upkeep of a building and equipment can add much to working efficiency.

Present-day industrial art, insofar as it is developed, reflects the metallic precision and streamlining which typifies this age. Even when these characteristics are not absolutely necessary from the standpoint of functional design, they are being incorporated because of their artistic attractiveness. Nor is there any great disparity between the the practical and the artistic value of these changes. The simplicity of modern industrial art facilitates cleaning, painting, and maintenance.

In the use of color, practical and aesthetic values may be combined. Rather than painting all machinery and equipment the conventional black or gray, a light shade of yellow has been found to be more restful for the workers' eyes, and more conducive to cleanliness and a pleasant working atmosphere.

From the standpoint of good lighting in the shop, a surface which is light in color and smooth or polished will reflect more light than a round, dark-colored surface. The

quality of illumination may often be improved by applying a light-colored flat paint to the walls, ceiling, and even large pieces of machinery and equipment.

From the standpoint of safety in the shop, accidents can be avoided or decreased by the adoption of three-dimensional painting. The floors can be painted gray, the base of the machine blue, and all non-operating parts white. All working parts and control surfaces can be left in their natural metallic luster. This visual contrast conditions the worker with a set of reflexes by which he concentrates on the working parts, where accidents can occur, and ignores the rest.

Most plant managers will agree that color in factories is accomplishing much to speed up work and to help prevent accidents brought about by the demand for speed and by the influx of new and relatively inexperienced workers.

To get the most utility out of color, here are some of the functions being applied. Red as a danger signal is giving way to a more prevalent use of yellow, yellow-green, and orange, all of which have much higher visibility and noticeability. Machines are being painted in lighter tones, both to reduce shadows and reflect more light, and to build up better contrast with materials handled. Brighter colors on floors increase illumination efficiency and throw light on the underside of equipment. Colorful walls offer relief from monotony and a chance to relax eyes which are tired by critical seeing tasks. Color engineering in the true sense of the word involves a careful study of the plant from the standpoint of proper color, having in view traffic, materials, and operations.

"Maybe we better discontinue it . . . all they ever suggest is money!"

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Many plants have reported real satisfaction with the distinctive color of machines. The idea of color for machines and equipment may be enlightening to those who have not given serious consideration to this subject. The basic idea of color painting of machines is to build employee morale. The color business is in line with emphasis on higher production and lower costs in the shop.

However, before an effective color job can be done in an individual plant, two prior conditions must be assumed. The first is orderly arrangement of equipment. If the plant gives the appearance of clutter and disorder, not even the most skillful use of color can achieve the desired effect. The second condition is proper lighting. No amount of painting can overcome the handicaps imposed by insufficient light or glaring lamps. With the orderly arrangement of equipment and proper lighting as prerequisites of an efficient shop, color for machines and mobile equipment used by the workers should be the next concern.

As far as color for machines is concerned, the traditional color for the stationary parts or body of the machine has been dark gray. While not offensive, this color is not exhilarating or particularly pleasing to the eye. Current preferences are running to medium gray, medium or dark green, brown, coral, and the less prominent shades of blue.

Further emphasizing the value of the color angle for machines, the control points, such as lever and switches, may be identified by color contrast for the purpose of facilitating speedy and safe operation. The identifying color should be yellow. However, some machines I have seen have a stripe or spot of yellow or orange on a control part which provides sufficient identification

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without the risk of introducing an unnecessary distraction.

The use of color is often suggested in order to provide a contrast between the material being fabricated and the worker's seeing area, or that part of the machine directly behind and adjacent to the operation on which his eyes are focused. For example, the worker ought not to be required to handle aluminum, or stainless steel against a background of light gray.

I have heard it said that this recommendation for color contrast in the worker's seeing area, while appealing in the abstract, is often impracticable in application. Most materials to be machined are placed on metal or wood surfaces that do not allow for painting. On the other hand, bench tops provide good opportunities for contrast between the material and the seeing area.

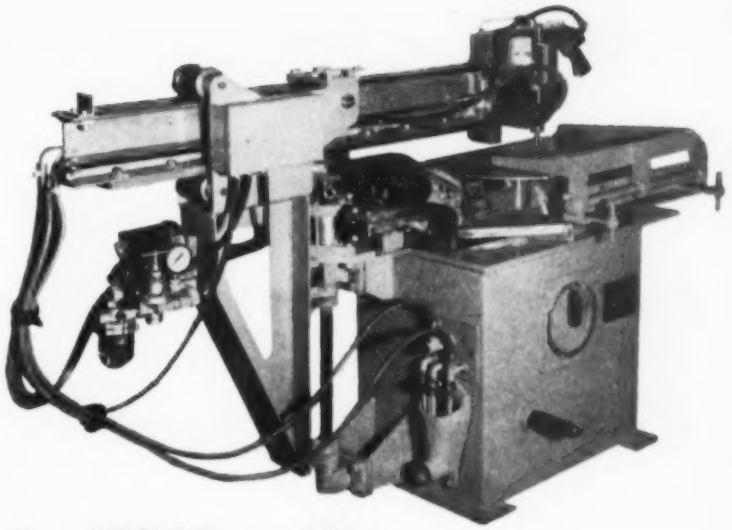
It is believed that the color scheme for machines can be carried a step further. It should also be applied to mobile equipment. Trucks, movable bins, skids, overhead cranes and conveyors, can be painted in colors of high visibility, preferably some value of yellow or orange. Solid colors may be used, or alternate stripes of color and black.

Of course some plant managers are "color blind," and are unconvinced of the value of color in the shop. They can't see the tieup between color painting of machinery and mobile equipment and high productivity.

Management may find that a beautiful plant, outside and inside, does not alone make for the pleasant and safe working conditions it desires for its employees. Painting of machine and equipment in color will foster these desirable conditions and be liked by workers because the sharp contrasts relieve eyestrain.

I know of one plant where production machines were painted green; worktables, operating arms,

"—This is where the new man from Texas operates—"



the $7500 welder that saved $25,000 the first year

A machine that increased production enough to effect savings that were double or triple the machine cost during the first year is news to many fabricators not familiar with the versatility of the modern resistance welder. With one man this machine will take the place of four conventional guns and two rocker arm welders requiring a total of six operators. It also eliminates the loss of production due to the unnecessary shifting of the work pieces between operations.

Here is factual proof that special equipment effecting cost saving need not be expensive.

Recent Federal designed and built machines have combined assembly with welding, forming with welding and high speed multiple-shop welding of complete assemblies.

This is part of the reason why—from the start—Federal has always been First In Resistance Welding.

This inner bulkhead assembly for an automatic dryer requires about 50 spot welds. Federal designed a new type expansion gun welder (above) where the gun is supported on the end of a horizontal beam mounted on rollers—moves in all directions—automatically welds as operator squeezes pistol trigger. Manufacturer figures this has saved $25,000 over old method during first year.

Federal WELDERS ®

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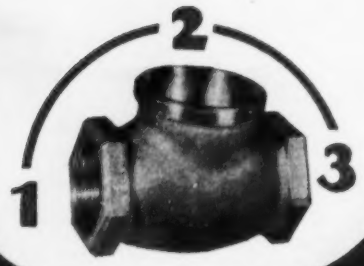
THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

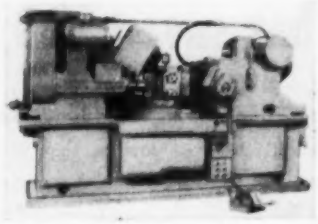


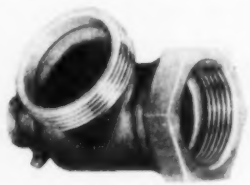
...and parts are finished without rehandling on

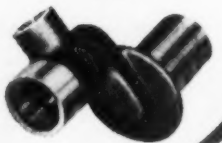
GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.







A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

and moving parts were buff; electrical controls and boxes were red. I understand that the results, aside from the bright and cheerful appearance, were found to be gratifying. Morale of the workers was improved. They were found to be taking a greater pride in keeping the machines cleaned. Also, eyestrain was found to be relieved.

Color engineering will definitely contribute to improved worker morale and efficiency, as well as reduce the plant housekeeping problem.

Harry Kaufman
Philadelphia, Pa

•

EVERY ONE of us appreciates being among pleasant and comfortable surroundings. Clean and healthy conditions around us tend to add to our satisfaction, and the painting of equipment in suitable colors adds to our comfort and peace of mind.

Clean and well-lighted shops attract and hold the best of the workmen in all of the trades. The hours under such conditions seem to roll around more quickly.

It goes without saying that a shop should be well-lighted for both safety and efficiency; without this there is loss in both time and production.

The value of bright clean surfaces does away with many shadows; therefore, it adds to safety.

The color of the paint should be determined for each part of the machine, as well as the machine as a whole, to get full advantage of the coloring.

Suitable coloring applies to both the shop and the machines it contains as well as to dark corners which are rubbish and dirt collectors.

John Mark May
Watervliet, NY

•

THERE IS NO question about it that anything that contributes toward raising the efficiency of the working force is worth considering.

One of the ways of creating a comfortable atmosphere is to brighten up the shop with a modest amount of color. All the color in the world will not help matters any if orderly arrangement of machinery, with plenty of working space and abundant lighting is neglected. All are essential to the harmonizing whole.

One can easily transform a good shop into a junk heap by daubing paint around with thoughtless abandon. Well thought-out, colorful atmosphere cannot but help in raising

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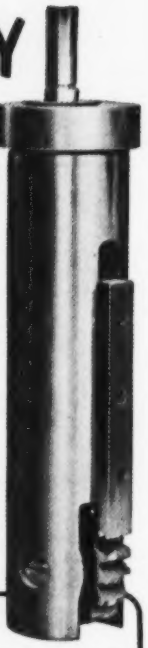
The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations that a keyseating machine can't reach. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed Rockwell hardened steel, accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

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the standard of orderliness about the shop.

There's no point in one shop adopting a color scheme and another having something entirely different. I am heartily in favor of standardization of color schemes, and would like to see it carried out so universally that the machine toolmakers would agree on what's advisable and finish their product to conform.

Homemade applications usually result in a shop looking like a carnival side show. I've seen some shops dolled up fit to kill with paint scattered about the machines as though it had been daubed on with a putty knife. I visited a school shop several years ago that was so colorful that I thought I was walking around among a group of circus wagons.

The monotonous dark finish in days of old is greatly to be preferred to ivory or Alice blue streaked with oil stains that usually show up so soon after the application. Better by far to have a modest shade of gray with brilliant red calling attention to the vital levers—there you have business-like atmosphere with a touch of life.

John Homewood
Ontario, Calif

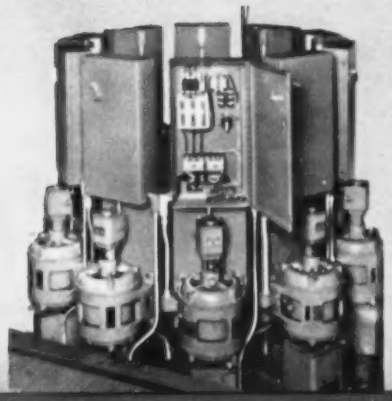
•

SINCE THE EARLY days of efficiency experts and the new industrial trends to improve working conditions for employees, the subject of color and its effect on productivity has been debated. As with many ideas, the idea of painting machines was originally developed in order to create a new field of study and to help dress up drab factory interiors. The basic feeling was that an individual spends more of his waking hours in the shop than at home, and therefore, color should play an important part in his work life. For each home has dabs of color to enhance its dreariness and to make it a liveable place.

So factory after factory has followed the pattern. Not every company has gone all out as have some of the larger organizations, yet suddenly some companies found that by using color the cleanliness of the plant was improved, and that because the product being produced depended upon clean working conditions, the productivity of the plant seemed to increase. Here then was the start of a drive to use color for better plant efficiency.

It has been successful in most instances. It has had an effect on workers, but not always in the same way. In one instance it was

SPEEDYELECTRIC STEAM-JET CLEANER—a compact "RA" Starter makes possible a neat surface mount for easy access.



ALLEN TAPPER & THREADER—conveniently located panels house "RAB" Starters controlling the reversing spindles.

TWIN-TOOL GRINDER—A-H Controls mounted on the side are neat, convenient to the operator, easily accessible.

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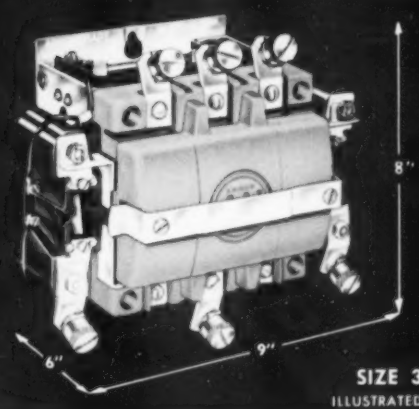

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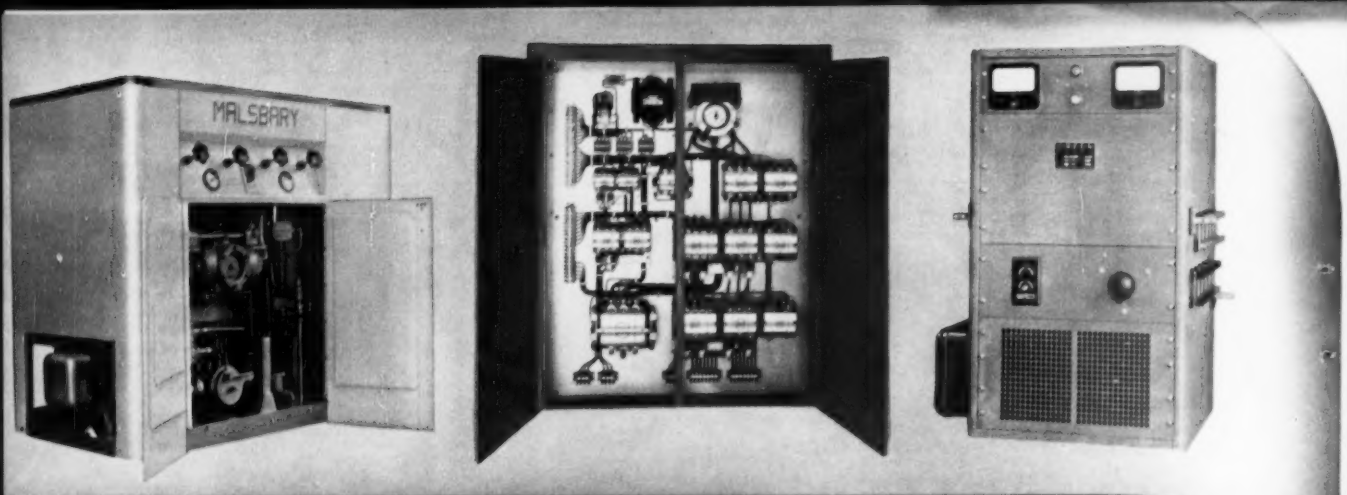

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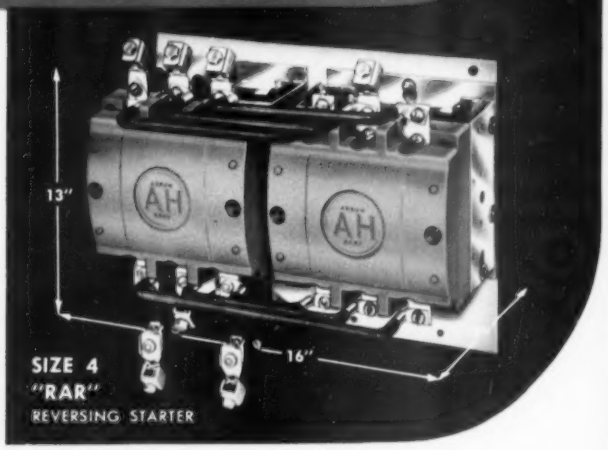

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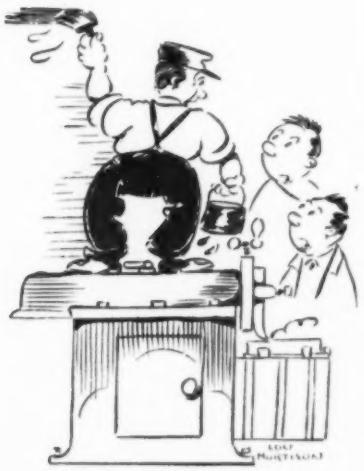
found that the color used actually caused accidents because the entire machine was painted in the same color, and the dangerous parts of the equipment were so blended into the rest of the machine that the operator was lulled into becoming careless. This immediately called for a new trend — the highlighting of dangerous points by using two colors.

Out of all the years of effort in developing the use of color has come one thing, and that is the knowledge that the right colors be used. It is indeed strange, but color has many effects on people. Constantly looking at some color tones can practically drive a person insane. There are cold colors and warm colors. There is the use of diagonal, vertical and horizontal lines. All of them today have their place in the color program. But in the combining of these features has grown up the new problem of what should be used and where. This phase has been studied by many, and its solution lies in the effect of color on people. We see a new field for engineers — color engineering.

It is not simple to pick the right paint, the suitable color, and the proper application, and to develop the most economical use for your industry. Into this goes the need for a knowledge of paint and its application to all types of metals, plastics, wood and other materials. Knowledge of the proper colors to effect an increase in productivity and to reduce hazards is also required. The story of maintaining the color program must be known. What does it cost, and is the shade tone used the proper one to keep the cost of maintenance low?



"He's showing me how he can paint the ceiling without moving his arm."

This Standard WENDT-SONIS tool saved 35% on one application!

THE PROBLEM

Finishing a 19" motor rocket body chucked with a rubber expansion arbor. The rubber expansion arbor made use of a coolant impossible. A high speed steel tool was tried but proved ineffective because no coolant could be used. Resulting high cutting temperature dulled the high speed steel almost immediately. Special carbide tools were being tried, but costs were high and delivery slow.

Harold Shelley
Ann Arbor, Mich.

THE SOLUTION

Harold Shelley of Gransden-Hall Co., Wendt-Sonis distributor in Ann Arbor, Mich., solved the problem. He recommended standard Wendt-Sonis BR-86 carbide tipped tool bits modified from a 15° to a 25° cutting angle. These Wendt-Sonis tools, taken from the distributor's stock, cut production costs and effected an overall saving of 35 per cent on the entire job.

WENDT-SONIS WILL SAVE YOU MONEY

Be sure you have the RIGHT tool for the job! You'll find that only Wendt-Sonis offers a complete line of dependable, precision carbide tools for every cutting application. All Wendt-Sonis Carbide-Tipped Tools have rust-resistant tool shanks made from highest quality steels for greater economy and faster production.

NEW! 1953 ILLUSTRATED W-S CATALOG

Write today for the new Wendt-Sonis illustrated catalog, number 53. Contains complete details and specifications for the W-S line of standard carbide tools. You'll find this a helpful source for selection of the proper tool for every tool application.

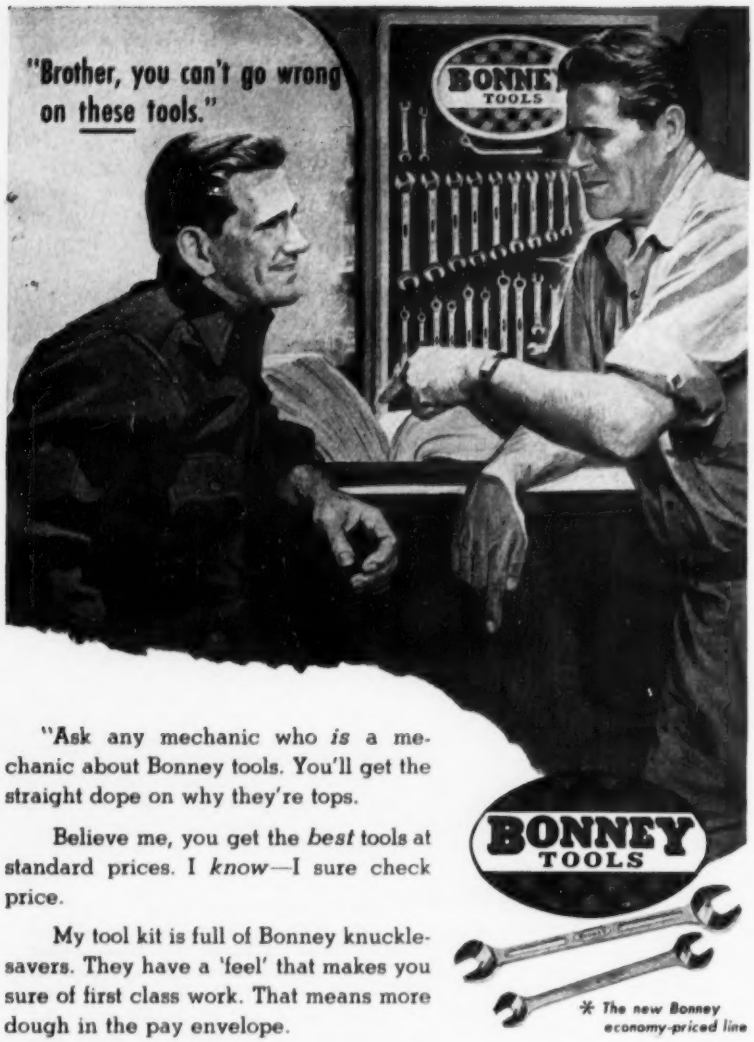
WENDT SONIS

HANNIBAL, MISSOURI

580 N. Prairie Ave., Hawthorne, California

549 West Randolph St. Chicago, Illinois

"THE MOST COMPLETE LINE OF CARBIDE CUTTING TOOLS"



"Ask any mechanic who *is* a mechanic about Bonney tools. You'll get the straight dope on why they're tops.

Believe me, you get the *best* tools at standard prices. I *know*—I sure check price.

My tool kit is full of Bonney knuckle-savers. They have a 'feel' that makes you sure of first class work. That means more dough in the pay envelope.

Another thing! If you're short on cash, take a look at a BON-E-CON* tool. They carry the standard Bonney guarantee."

BONNEY TOOLS

* *The new Bonney economy-priced line*

Remember. Your local Bonney jobber, as well as Bonney, stands behind the tools you buy. He has Bonney tools priced to fit your needs as well as your budget.

This is the way the men who buy their own tools feel about them. More and more foremen who are responsible for production figures recognize the value of this attitude on the part of mechanics.

BONNEY FORGE & TOOL WORKS • ALLENTOWN • PENNSYLVANIA

Color is a big factor in today's industrial world in keeping production rolling, but it also can be overemphasized. Proper layout of machines and the proper lighting still have a place as leading factors in the field of industrial management in order to obtain the greatest increase in productivity for the dollar spent. When all is accomplished in this field of color, then engineering can carry on and eke the last piece out of the machine. Both programs are easily worked together and thus the net saving becomes higher.

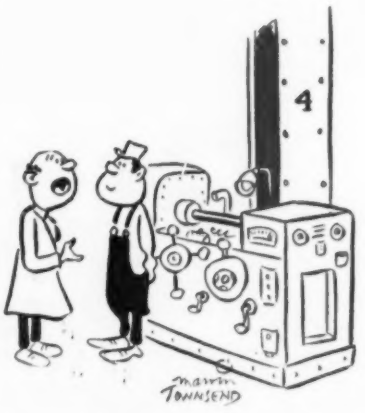
Color makes a plant a showplace, but don't use it for this purpose only. The effect in this case is to decrease production. Plant visitations by the president and his parties actually serve to slow down production. Color engineering in the years to come is a field in which only the experts can hope to see the ultimate gain to our industrial world. Better color might well increase our standard of living. It might serve to create many new jobs. Only the future can tell. It has done much to date in some industries. It has very definitely paid off.

Charles D Townsend
West Hartford, Conn

•

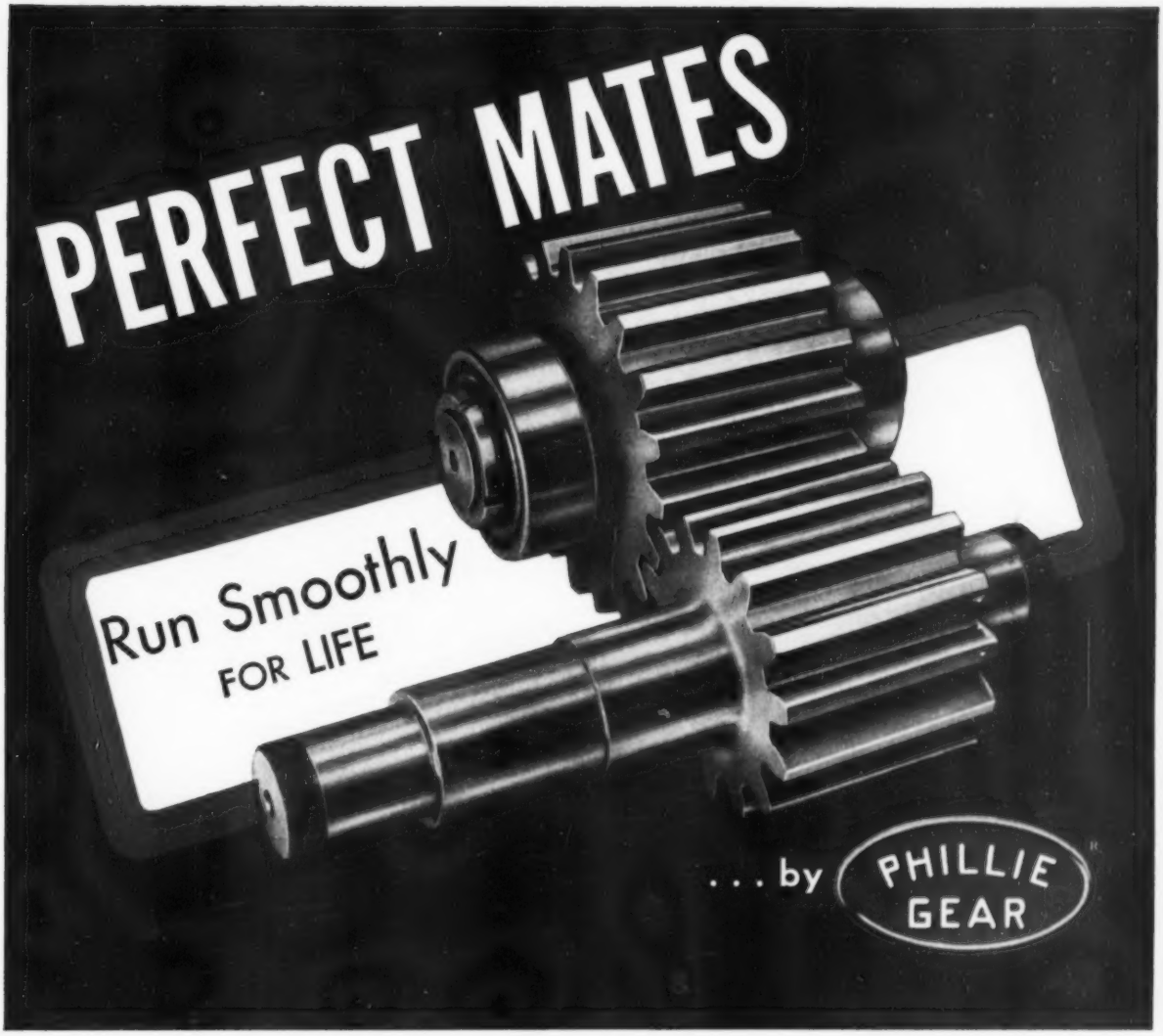
BEFORE USING the term "color blind" in relation to machine tools, let's first of all use the proper term—"color dynamics." Several paint manufacturers have cooperated with various plants in carrying out extensive tests on the effects of color dynamics. It is now a foregone conclusion that the results of these experiments will have effect on all types of manufacturing.

In my opinion, the basic advantages of color dynamics have accom-



"All I ask is that you operate this machine with the same skill and precision with which you tune in your television set."

PERFECT MATES



For any gear to work efficiently and give Long Service Life, it *must* be a "*perfect mate*" with the other gear (or gears) with which it is to mesh—this applies to Spurs, Helicals, Spiral-Bevels, Worms, Herringbones, etc. . . . no gear by itself is worth much.

At "Phillie Gear", we have "specialized" for over 60 years in making all our gears "*Perfect Mates*",—and, to accomplish this, we use only the latest gear machines; the finest metals and alloys, and the latest methods—not only for gear cutting, but also for Machining, Heat Treating, Hardening, Shaving, Lapping, Inspection, and Shipping.

So, if you need any Type, Size or Quantity of Gears,—*consult "Phillie Gear" Engineers first.*

You'll want a free copy of the well-known "Gear Book" . . . it's practically a "treatise" on gears.

Philadelphia Gear Works, INC.

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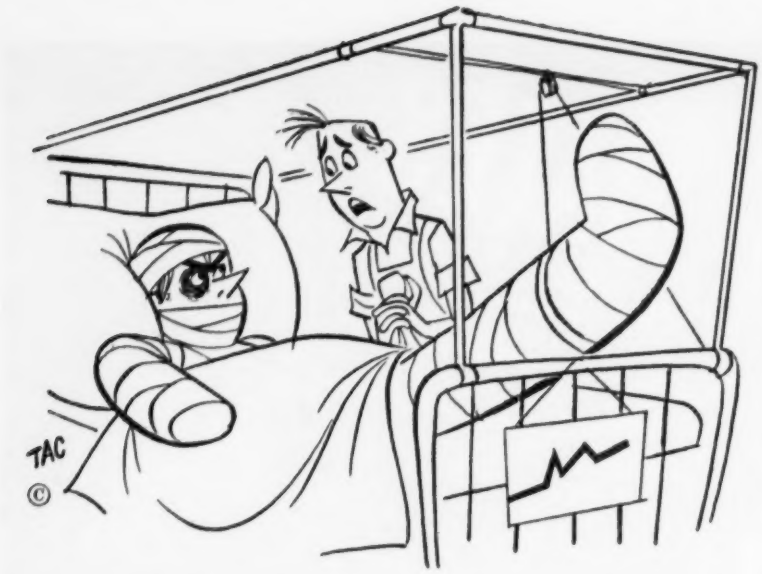
Industrial Gears and Speed Reducers
LimiTorque Valve Controls



"Sorry I did it, Sam, but when you told me you forgot to re-order my OILDIE tool steel I guess I just lost my head."

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Producers of fine tool steels—High Speed Steels
Die Steels—Hot Work and Shock Resisting Steels
Carbon Tool Steels.

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In your cutting operations with your

RUTHMAN GUSHER COOLANT PUMPS

Your Gusher gives you—

❶ ECONOMY—Uses less power when throttled—requires less attention—

❷ LONG LIFE—Simple design—electronically balanced rotating parts—precision construction, assures long life.

❸ EFFICIENCY—Responds instantly with copious coolant flow.

For a better coolant pump specify Gusher Pumps on your metal cutting machine.

This Superior Honing Machine is equipped with a Ruthman Gusher Pump—Follow the leader; specify Ruthman on your machine.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

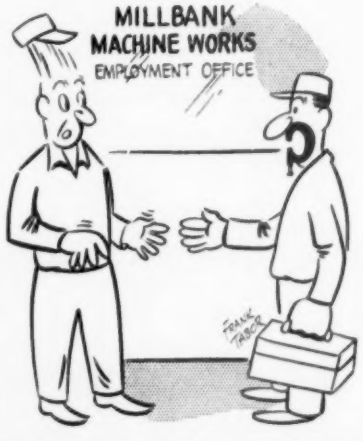
plished the following—in the order of their importance:

1. High degree of safety
2. Cleanliness
3. Better light
4. Pleasant working conditions
5. Production increases

A high degree of safety has resulted from the employment of contrasting colors of work and machine. Such contrast naturally reduces eyestrain and causes the right moves to be made at the right time. By having all controls and moving parts painted in sharp contrast with the rigid part of a machine, searching is almost eliminated. The importance of operator safety cannot be overemphasized, and color dynamics have already made large strides in this direction.

Since the extensive application of attractive colors on automobiles, the manufacturers of cleaners and polishes have hit a new high in sales. Is there any doubt then, that when a machine tool is attractively painted, it will get far more cleaning attention? It is needless to say that the appearance of dirty oil does not look well on a background of yellow, cream or green. So, in order to clean off the oil, the operator will take dirt and chips along. The net result is that operators need little or no reminders to clean their machine. Attractive colors encourage good housekeeping.

I visited an old, established machine shop about a year ago and was discouragingly impressed by the lack of light. The shop apparently hadn't been cleaned or painted since it was built. The old familiar drop cord with a dirty bulb still hung in sockets over many of the machines. I was not surprised to learn that most of the men were old-timers and several had served the com-



"I'm the new machinist. Just call me 'Mike'."

Here's that extra small size set you have needed!

20 out of 38 blocks between .05005" — .059"

Don't allow missing gage blocks to slow up inspection. When key blocks are being used elsewhere a second set comes in mighty handy.

The 38 block set is predominantly a set designed for small dimensions but serves adequately in supplementing larger sets.

In addition to costing less than a full size set it also has a wider range in small dimensions.

Twenty of the 38 blocks are in range between .05005" to .059". Every set includes wear blocks. Write for prices and description.

ACCESSORIES THAT MULTIPLY THE USEFULNESS OF STANDARD GAGE BLOCKS

When blocks are combined with accessories they serve as snap gage, height gage, ring gage, plug gage, calipers and scribers.

Webber GAGE BLOCKS

WEBBER GAGE COMPANY
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Largest exclusive manufacturer of precision gage blocks

EVERY TYPE OF CUT GEAR FOR EVERY INDUSTRIAL PURPOSE

SINCE 1888... We have been making many types and sizes of gears for industry. During these passing years we have derived considerable experience, trained numerous personnel, and expanded our mechanical and plant facilities—and have remained under one continuous management. We are ready to ably serve you.

CONTINUOUS-TOOTH HERRINGBONE GEAR
1" to 60" diameter, 16⅔ DP to 1⅓ DP and up to 20" face.

WORM GEAR
1" to 58" diameter, from 24 DP to 1 DP.

SPUR GEARS
From ¾" to 150" diameter, 32 DP to ¾ DP and up to 30" face.

HELICAL GEARS
From 1" to 72" diameter, 24 DP to 1⅓ DP and up to 20" face.

BEVEL GEARS
(Straight Tooth)
From 1" to 60" diameter, 24 DP to ¾ DP.

SPIRAL BEVEL GEARS
From 1" to 30" diameter, 24 DP to 1⅓ DP.

ESTABLISHED 1888

D. O. James

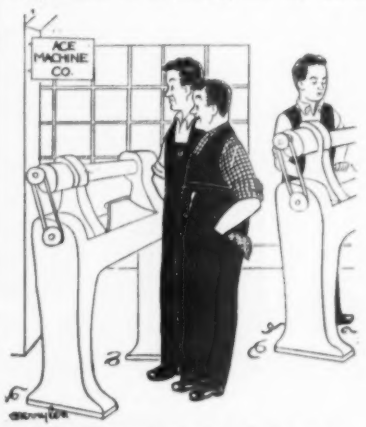
D. O. JAMES GEAR MANUFACTURING CO.
1140 W. Monroe Street, Chicago 7, Ill.

pany since the turn of the century. The superintendent explained that it was extremely difficult to obtain new help—and keep them. Shop men today won't and don't have to work in a dull and dimly lighted plant. They have learned the benefits of good lighting, and I can't blame them for demanding it wherever they go. The employment of color dynamics has helped make this pleasant atmosphere of good light possible.

The use of color dynamics is not complete without improvements in handling and storage. Pleasant working conditions have been accomplished through the use of color and freedom of movement. Freedom of the body while on the job is important to efficient operation. Through the use of various colors to distinguish different objects, the degree of operator satisfaction is substantially increased. Moving parts or equipment in contrasting colors will quickly catch the workers' eyes and enable them to make quicker and more effective moves in the right direction.

With the inauguration of color dynamics and the resulting safety benefits—cleaner, lighter and more pleasant working conditions, increased production is a natural result. People who feel safe, and enjoy their work, will produce more—and with less supervision. To enjoy their work they must be given certain considerations by their employer, who indirectly taps that vital source of human energy.

Several years ago I designed and built a special testing machine. It was designed to be practical, yet streamlined to a point where color dynamics could well be applied. However, company policy at that time did not permit any machine to be painted in anything but the dark



"Tough luck about Higgins—he asked for a raise while the boss was making out his income tax returns."

gray, so common in so many places. I was disappointed, but didn't give up. A few years later I was assigned to a special tooling program which was intended to extend over a period of a few years or more. My very first act was to promote the use of color dynamics. This was accomplished in a surprisingly short time, which enables us to order new equipment with color dynamics already applied. As machine tools arrived, all were painted in the green shades, with controls and moving parts painted according to accepted standards. The results of this program spread to other departments and to other buildings of the plant. It is now general practice that when machines are recived, or overhauled, they are finished in color combinations. We are gradually eliminating the old prison-gray finish of machine tools and surrounding equipment.

The same change has taken place in many other plants all over the country, and they don't go back to the old way. It is therefore a new and accepted standard. Anyone who discourages the use of color dynamics was not only born thirty years too soon, but has failed to keep abreast of many of those about him.

Many manufacturers of machine tools are still reluctant to furnish color dynamics as standard finishes. They require special orders. Why should they not reverse the procedure, by requiring special orders to paint a machine in the old gray finish? They are on the ground floor and could do a lot to promote the needs and desires of plant management. Time and money could be saved by establishing color procedures right from the start.

I would like to see *American Machinist*, and other trade publications, run a complete article on color dynamics (*we've published two*—Ed.) Material is available from paint manufacturers, who show accepted combinations of colors for machine tools, walls, ceilings, and handling equipment. This is 1952; let's be ornamental, as well as practical—and reap the benefits.

A F Scoblic
Milwaukee, Wis

PRIVACY, PLEASE

EMPLOYEES DO not like changes they are not notified about in advance. They do not like unannounced changes even when it affects them only indirectly.

In my opinion, those employees who have to work in stalls will feel

the *tougher* the cutting job . . .
the *better* the opportunity for . . .

Abrasive Cutting

"FOR HEAVEN'S SAKE, SAWYER . . . HOW DID YOU GET INTO THIS FIX?"

Unusual cutting conditions like this are the exception . . . but whether you have a specialized application or a mass production job, you can depend on Allison Wheels. Whatever the material to be cut, there is an Allison Abrasive Cutting Wheel processed and formulated to fit the job. This means faster cutting with fewer rejects and reduced operating costs.

If you have a cutting problem, go to Allison — the specialist in abrasive cutting.

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THE *only* WAY TO CUT SOME

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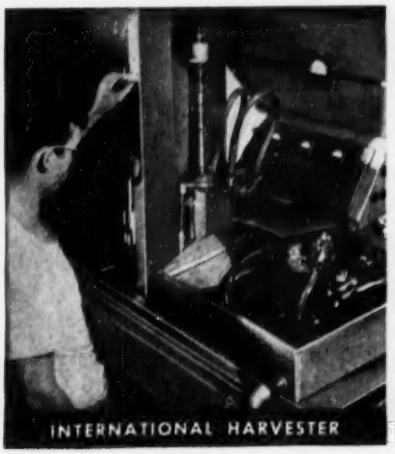
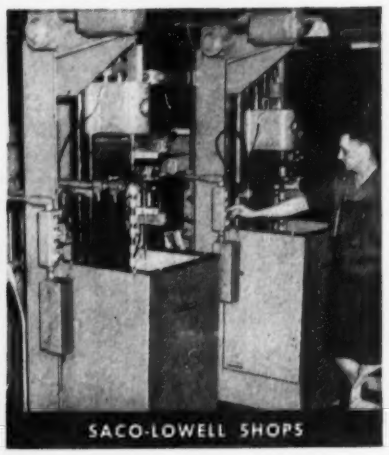
SALES

From Tractors to Textiles

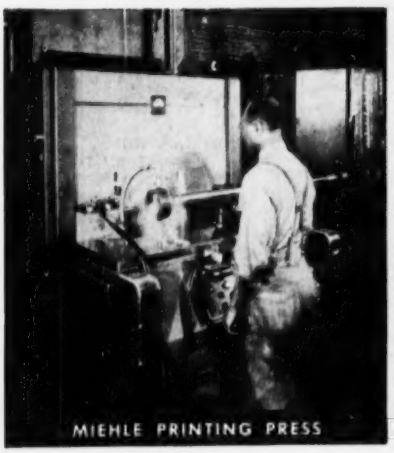


INTERNATIONAL HARVESTER



SACO-LOWELL SHOPS

from Presses to Planes



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fenced in. Most employees like to feel free to move around; they like to see what's going on around them. They will resent anything that blocks their view. They will not want to be closed in during hot weather.

There are also the eager beavers to consider those employees who like to make adjustments or layout on the bench while taking cuts on the miller, shaper, or grinder. I personally would not like less air, light or elbow room.

The wise leader lets the employees know in advance of all changes and the reason for them. He asks for suggestions and makes the employee feel he is a part of the change. This is the best way to make a change without resentment and discord in the department.

A E Salmons
Philadelphia, Pa

•

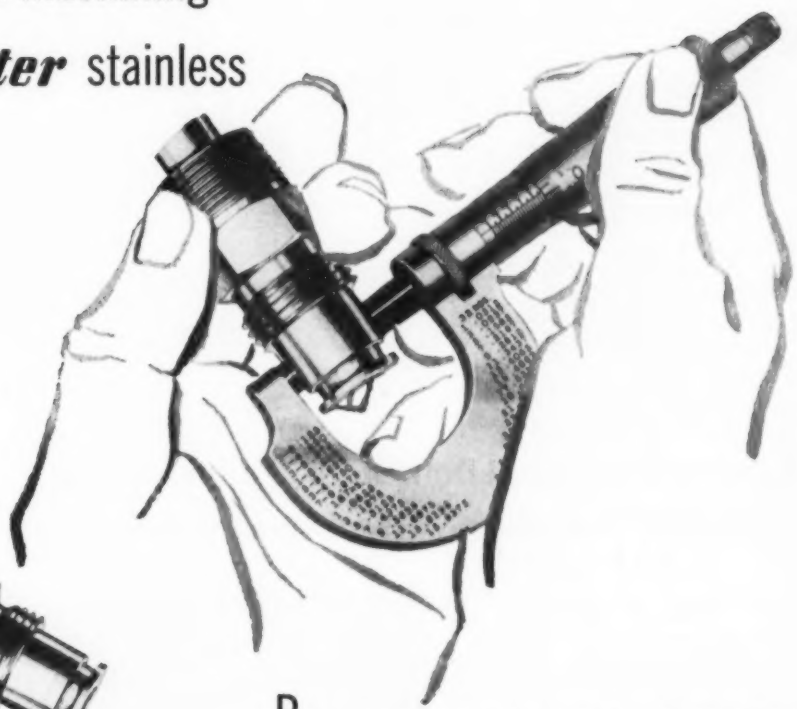
WHEN I FIRST saw the illustration accompanying the "Privacy, Please" Round Table, I had an idea that I was looking into the men's washroom at the S P Station at Third and Townsend. Finally I tumbled to the possibility that Bill Snibbs was laying out something on the bench and was being protected from interfering eyes of his workmates.

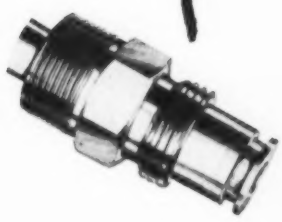
From my viewpoint, I'd say that a worker is boxed in too much now and I heartily disapprove of anything that will encase him further. I suppose I'm just allergic to anything in the form of confinement, having spent so many years on the open prairies where everything is out in the open; even the one-seater —Chick's famous $3.95 bargain— stands quaking in the penetrating westerly winds.

I don't like to approve or disapprove of anything until I have

"Do you see anything on this blueprint, Jones, about allowing greater tolerances on parts if you happen to have a hangover?"

You get a far higher number of **good ones** on each run when machining *Carpenter* stainless





Rejects on this needle valve part dropped 30% when the company changed to Carpenter No. 8, Type 303.

Plant records prove it: a big majority of the troubles in machining stainless parts just aren't necessary! That's why we'd like to show you what can happen when you change from a run-of-the-mill free-machining stainless to a Carpenter Free-Machining grade. Records prove that on many jobs, rejects take a nosedive, tool life goes up, and costs down. That's because Carpenter Stainless is made in a specialty tool steel mill to highest tool steel quality standards. The same careful controls are applied to make sure every bar of Carpenter Stainless will work the same. It stands to reason that with Stainless like this you can get more good parts out of the lot. Isn't it worth a try? Just specify "Carpenter" on your next production order. The Carpenter Steel Company, 109 W. Bern St., Reading, Pa.

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Carpenter STEEL

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takes the problems out of production

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor

Backstand Belts save 2 hours per day!

Armour Backstand Belts save 2 full hours per operator per day for steel tube company*

In removing burrs and grip marks from steel tubing, a well-known company* found they saved more than just the two hours per day operators had been given to make set-up wheels. Backstand belts outlast 4 to 5 set-up wheels—and without dressing they remain flat and true. And backstand belts give a better finish, due to their uniform grit.

Belts are only one of the many forms of Armour coated abrasives. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, discs, rolls, tubes—and specialties to meet your specifications. Your industrial supply distributor will tell you about this complete line. Call him today!

And, today—mail the coupon below for your free copy of our booklet, "How to Store Coated Abrasives." It can help you, too!

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weighed it over in my mind sufficiently to justify my conclusion. Privacy is desirable when one needs to concentrate. It's a certainty that a man can think better if he has a certain degree of freedom from the many distractions—like the blinder-equipped horse, he can go forward uninterrfupted by the many annoyances that would throw him off his track. I'll admit the advisability of a certain amount of orderliness about the worker's bench which can be enhanced by a limited degree of separation from his fellow worker's territory, but I draw the line on an isolated stall which would deprive the worker of close association with his apron-bedecked companions. A man spends most of his sunny hours cooped up behind the four walls of a building, and the least we can do for him is to grant him a little freedom wherein he can feel at home among his fellow workers.

There are many men who no doubt like the idea of this arrangement, but I'm pretty sure that the rank and file would prefer to be out in the open yapping away with their comrades while they proceeded with their legitimate work.

The advantage of privacy will be offset by its disadvantages. While Al is at his desk sizing up the shop situation how is he to know what's going on behind those fences? There were times in the past when I would have been delighted to have had such protection as I worked on "government" jobs of my own. While it is against the rules in some shops to eat during working hours, isn't it possible for the worker to consume one or two hot dogs or sugar-coated doughnuts without detection? Won't the advantages of privacy be offset by the upsetting display of bathing

"You guys had to insist on a closed shop!"

beauties within the confines of the worker's three walls? I'll bet two bits to a plugged nickel that Al will find a pet kitten or pup bedded down in straw or waste in a corner somewhere.

Jack Everett
San Francisco, Calif

•

NOW POOR OLD Al has the toolroom looking like a combination horse stall and latrine. It seems that Al is stressing privacy to the elastic limit when he boxes in the men to such an extent that all one can see of them is their wiggling, parabolic rearendus.

I'd like to suggest a modification of Al's scheme. My suggestion will accomplish the purpose of privacy without the horse-stall features which I am afraid will bring down the pillars of indignation upon Al's weary head. If we are going to resort to such divisional sections, I like the idea of a definite section of the bench, that one can call his allotted domain, created by a small partition extending about two feet from the wall and no higher than one foot. This is sufficient to limit a man's territory—his private working territory. This sort of gives him a small yard he can call his own. He'll take pride in his section of the bench when he knows that the partition designates the boundary line between his section and his neighbor's.

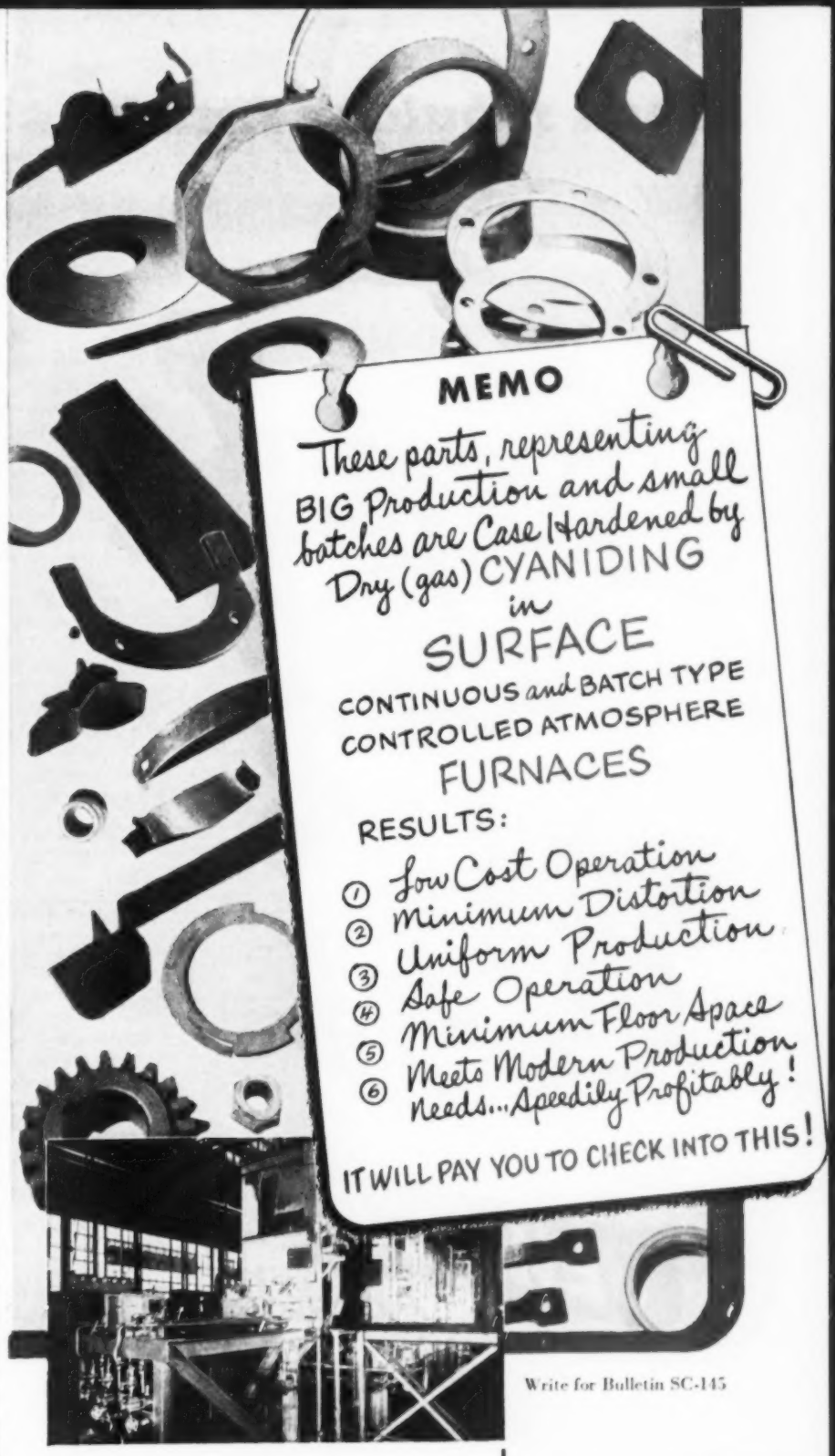
Toolmakers as a general rule are a gregarious lot and delight in a certain amount of kidding now and then, but I am sure that they will appreciate a reasonable degree of privacy obtained by the divisional partition as suggested above.

John Homewood
Ontario, Calif

•

THIS CERTAINLY is a new idea that Al has dreamed up. The first reaction will be to say, "No, it won't work." Strangely enough, this quick negative reaction is so strong that many good ideas are held back for years and kept from being used.

But to return to the subject of shop stalls—first let us look at Al's reasons for doing it and see where the merit lies. Efficiency was offered as one reason. Efficiency means the degree of being capable, or the ratio of the energy that is obtained from a machine. It is seriously doubted that by placing individuals in confined areas efficiency is increased. The ratio tends to drop off at both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IT WILL PAY YOU TO CHECK INTO THIS!

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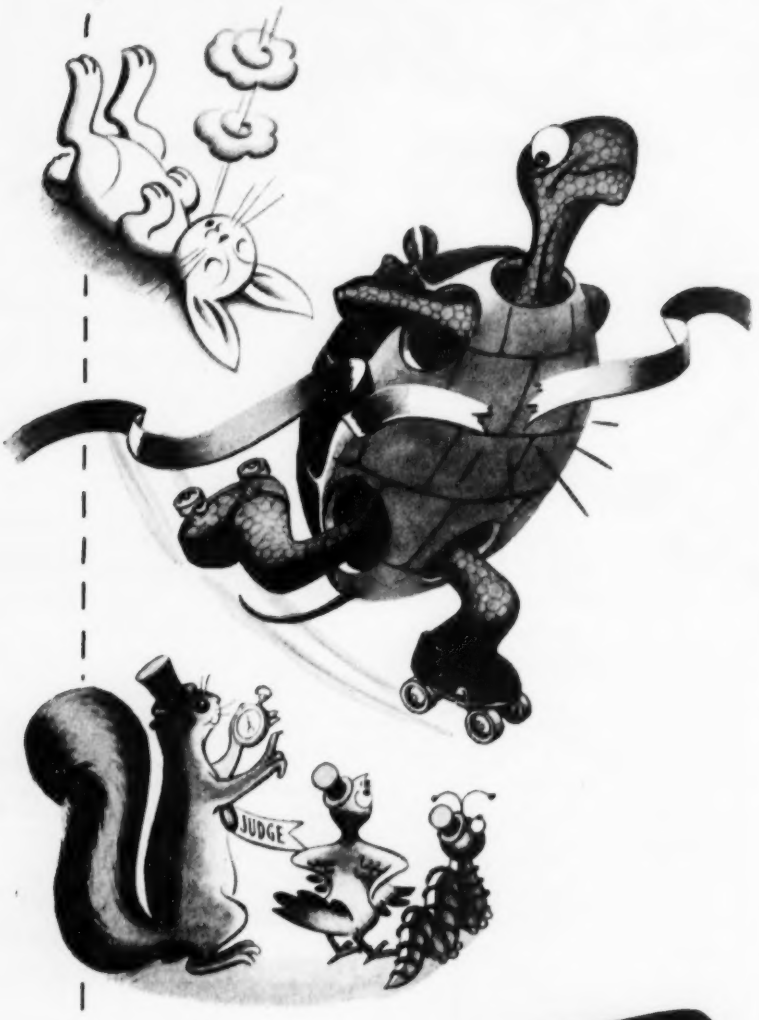
for a fabulous finish...



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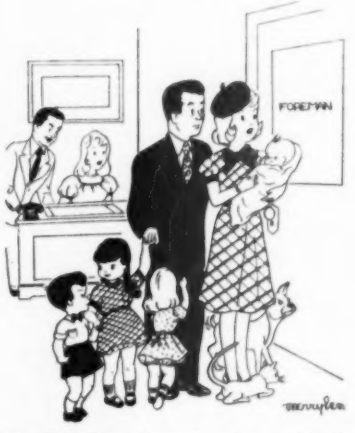
51 Pearl Street
South Braintree 85, Massachusetts

ends of the curve. On the one hand, if too much interference is had—that is, if too many people are butting into a man's production or his job, then he becomes distracted and his efficiency drops off. At the other end of the scale, if he is confined, such as these stalls tend to do, he may become too exacting, and will frequently putter along. No one watches his operation and the privacy allows him to kill time. Therefore, his output drops off.

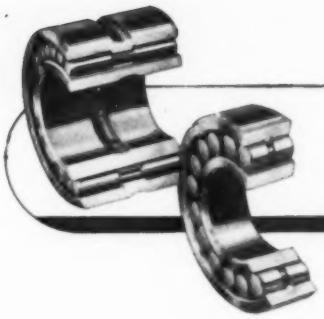
In order to have top efficiency within a plant, a combination of the two opposites must be brought into balance. And, too, an individual works best under harmonious conditions where he is competing with his friends and where he can talk once in a while to relieve the monotony of the job and lessen his fatigue.

Stalls do not increase efficiency. Changes in working conditions are always found debatable by the workers. Constant upheavals cause loss in production. People just don't like to change. It takes energy to change and none of us likes to exert undo energy unless it is necessary. We all like to take it easy, and would, if the world were so built that we might. It is always a mistake to make too many changes in working conditions. Radical changes such as this move will take months to work out and absorb the adjustments.

Stalls are the equivalent of private offices. A new thought to say the least. What does Al know about private offices? Does he have one? How private? Actually there is no such thing in a company today. Private offices are only the names tagged onto the doors. What goes on behind the door is far from one individual's work. Here policies are made by several. Here is where meetings are held to discuss how to



"Oh, Oh! Guess Jones is going to hit the boss for a raise again."



Over 33% Greater Capacity For The Same Size

There is a challenge facing manufacturers today to build smaller and more compact machines with extra precision and to combine more operations in each machine. This makes the selection of the proper bearings extremely important. A definite plus factor in this selection is the availability of a precision bearing that will deliver extra load carrying capacity in a minimum amount of space.

Obviously roller bearings, and particularly those of the small (needle) roller type occupy far less bearing space for equivalent capacity than ball bearings. Roller bearing capacity is built up in proportion to the effective race and roller contact provided. Thus a full type roller bearing *without space wasting cages* should provide the greatest capacity of any type of anti-friction bearing. However, to offer a perfect bearing the resulting full roller complement must be prevented from skewing and binding where misalignment occurs in the application.

The Guiderol bearing is the accepted answer to all these requirements considering precision, load capacity,

Bearing	McGill Guiderol No. GRI-209	Brand A Bearing	Brand B Bearing	Brand C Bearing	Brand D Bearing
Published Load Rating	8370 lbs.	6700 lbs.	7000 lbs.	5520 lbs.	6080 lbs.

Capacities at 2500 hours average life at 100 RPM

long life, versatility of mounting, and ease of lubrication. Published ratings show the Guiderol CT Series bearing has over 33% greater load carrying capacity than the average of the four highest rated interchangeable bearings. As a result, a Guiderol bearing at least one size smaller can often be substituted with the necessary shaft and housing requirements reduced in size and cost.

How Rollers Are Guided

In the Guiderol bearing design the grooved rollers with full race width contact are prevented from skewing by a center guide rail. Normally the rollers run on a true axis

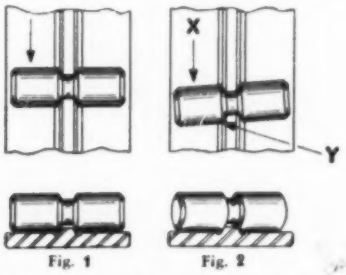
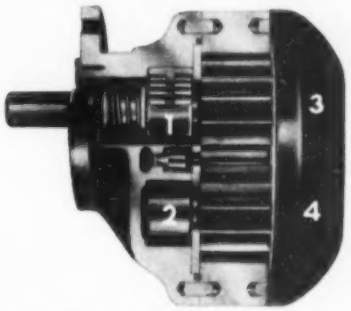


Fig. 1 Fig. 2

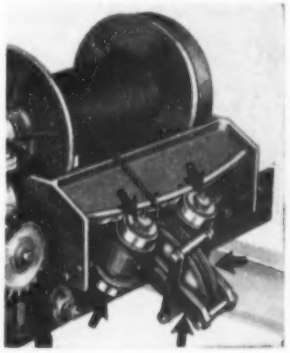
— not contacting the rail and thus need no correcting. (Fig. 1) Should misalignment cause a shift off center (Fig. 2) the leading end of the roller is retarded by contact with the rail at location Y. The trailing end catches up, relieving the rail contact, and the roller then resumes normal operation.

Typical GUIDEROL® Bearing Mountings

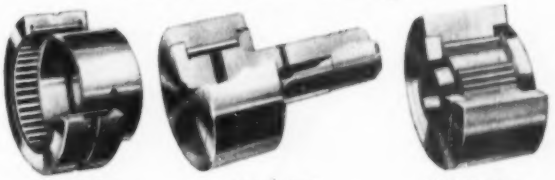


On a Hydreco Gear Pump Idler and Drive Shaft, 4 Guiderol bearings are used. The longer rollers of the Guiderol bearings are effective virtually to the edge of the races. This gives substantial support close to the gear and materially reduces shaft deflection.

Four Guiderol bearings support and guide an automatic spooling attachment across the face of the reel track on a 20,000 pound Gar Wood Reel-Lite Winch. The guided roller principle prevents skewing of rollers in the 4 vertically mounted bearings even with a 10,000 pound angular load per bearing. A fifth Guiderol bearing in the sheave provides added stability and eliminates binding due to off-center loading.



MULTIROL® Bearings



SE Series CF Series CYR Series

A new 140-page Bearing Reference Guide complete with 30 pages of vital engineering data has just been released by the McGill Manufacturing Company.

It has the full story on the advantages of Guiderol Bearings and in addition contains complete information on the well-known Multirol CF, CYR and SE Bearings. *Send now for your copy of the McGill Catalog No. 52.*

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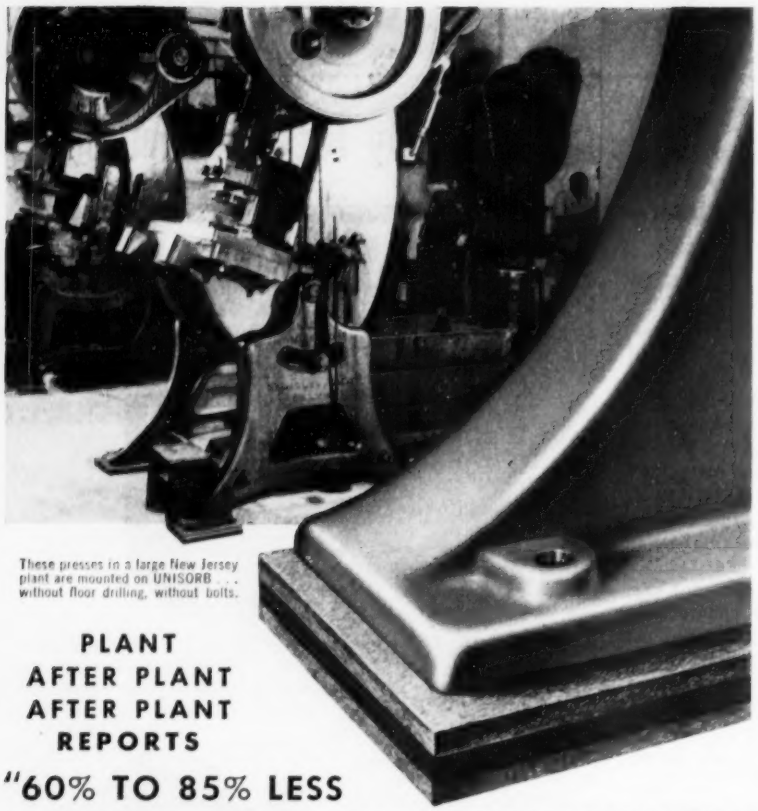

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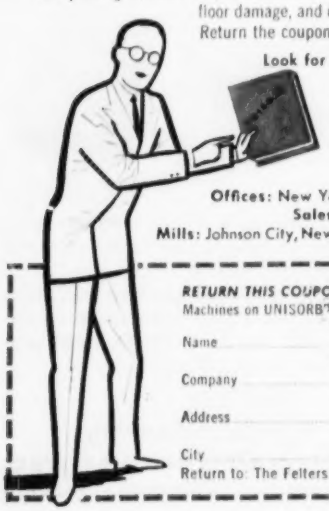
UNISORB is provided in the proper thickness and density for your specific job. It is used with cement that sets overnight. Or, for machines that do not require shimming, UNISORB is available precoated with adhesive.

You prolong machine life, reduce transmitted vibration and noise 60% to 85%. You eliminate floor damage, and it's easy to reposition machines mounted on UNISORB. Return the coupon today for your copy of the UNISORB book.



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run the company. Not one man but several use the private office in determining how to do the work.

This is a common error. Many consider that the private office is where the big boss sits with his feet on the desk smoking a cigar and working completely alone. The scene is a far cry from that, and anyone who desires to sit in a private office today and work alone soon finds himself lost in this world of cooperative effort and complex problems. It takes many minds to keep organizations running. It takes a proportional number of minds to keep production on the individual job going smoothly.

We have no place for stalls in our modern production lines. We have only the place for cooperative effort of all workers working for the common cause—better quality, and lower productive cost. This motto means success and better living conditions for all.

For some jobs perhaps stalls would work successfully in order to prevent loose talk about secret work, but certainly not to use the stall as a blinder to keep men from talking to each other. Take down the stalls and in their place have the foremen build up more cooperative efforts on the part of all workers. This will do more to help all concerned than the stalls ever can.

Charles D Townsend
West Hartford, Conn

•

SPEAKING OF EFFICIENCY reminds me of one of the characters in a Gilbert and Sullivan operetta who "did nothing in particular, and did it very well." Putting up stalls along workbenches for privacy is a form of questionable efficiency that will accomplish nothing constructive in particular, and might encourage lax-

"On my last job I worked in a victrola in a victrola in a victrola factory."

"Those trainers say the champ can take it like a

Logan LATHE!"

Logan No. 955
QUICK CHANGE GEAR LATHE
11" Swing, 1" Collet
Capacity, 1⅜" Spindle Hole

WORKHORSE schedules are the lot of Logan Lathes because industry knows it pays to keep the Logans turning. Durable as well as accurate, the Logan *stays* profitable to operate. Sustained accuracy is built into its ball bearing spindle and into the rugged, balanced, warp-free bed with two V-ways and two flat ways precision ground to a tolerance of .0005". The entire lathe is ruggedly proportioned. Self lubricating bronze bearings protect vital points against wear. Construction like this makes your Logan Lathe with its 11" swing and 1" collet capacity a tool that can "take it" through extra years. That is the big reason why no other lathe of comparable specifications can match Logan economy.

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THESE bronze bars have many uses, particularly where their free machining properties are important. Many manufacturers find Johnson Universal Bronze ideal for certain gears and pinions, guide rollers, sheaves, trolley wheels, tips for air tools, washers, thrust plates, as well as for bushings and bearings. The cost per pound is offset many times by the low cost of machining. Non-sparking properties and corrosion resistance recommend it for certain uses. Another big advantage is that Johnson Universal Bronze is available from distributors' stocks, fully machined, in solid bars $\frac{5}{8}$" to 8" diameters and in cored bars from $\frac{1}{2}$" to $7\frac{3}{4}$" inside diameters—in all, over 400 sizes. Also available in hexagon bars from $\frac{5}{8}$" to 3" outside diameters. Each bar is usable from end to end, no waste.

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JOHNSON JB BEARINGS
Sleeve Type

ity and slowdown in the worker. It seems to me to be the hard way to encourage loafing and soldiering on the job. There *should* be easier ways to give a man privacy—including a little more working room.

The surroundings in which an employee works are an important factor in both the quality of work he does and his attitude toward his employers. Heat, ventilation, light, appearance of the room, noise—all these add up to an impression of attractiveness or repulsion which the worker subconsciously formulates in his mind. Not only is it impossible for the employee to work efficiently amid unfavorable surroundings, but in the long run these same surroundings also influence the quality of work through their effect upon the worker's health.

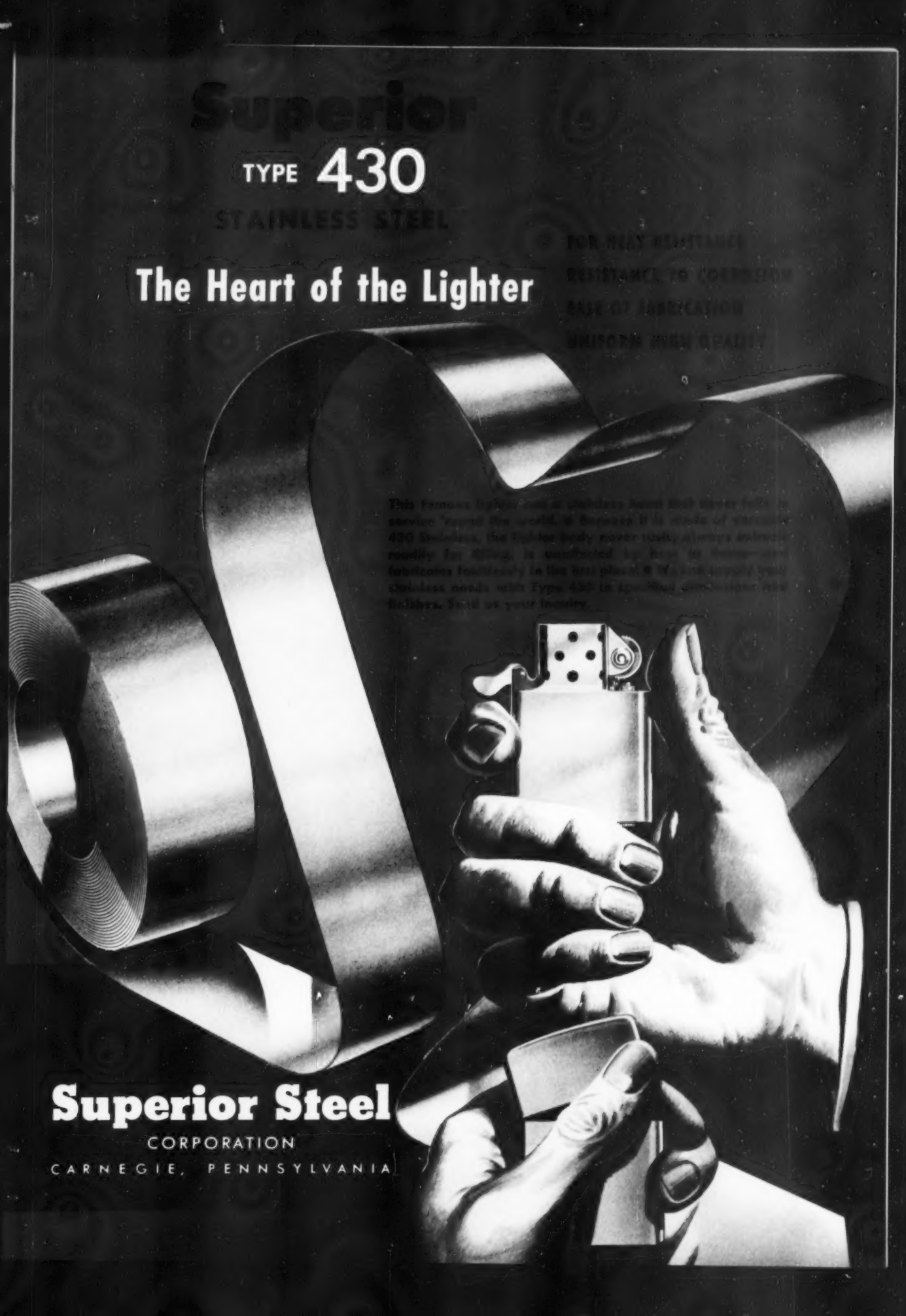
Of course, it is the responsibility of management to study the requirements for each process of work and make adequate provision for the health, safety, and comfort of the workers. Changes in working conditions must be on the positive side and have a definite reason for adoption. Stalls for privacy, in my opinion, will not serve any useful purpose; they are not conducive to cooperation of the workers as a team. When each man has his own private sanctum, and does not care or give thought to how his work will affect his neighbor's efforts, there can be no concerted effort for cooperation and teamwork.

To obtain production requires the united efforts of all of the workers. By putting up barriers under the mistaken idea that privacy will encourage efficiency, management is not giving due consideration to the fact that most workers like to work with their fellow-employees, and not go it alone.

Rather than providing privacy stalls for its workers, management should not skimp in providing clean, comfortable, modern facilities for work. Good morale is the result of careful attention to attractiveness and comfort by management to its workplace. Employee reaction will be favorable to the management which provides a working place that is clean, well-lighted, and safe. Installation of privacy stalls is relatively unimportant and will not have any decided effect on efficiency in production.

We can all learn from each other. The installation of any device that will hinder such cooperative learning is not a beneficial change in working conditions.

Harry Kaufman
Philadelphia, Pa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PATENT APPLIED FOR

New Taft-Peirce COMPUTING CompAIRator FIGURES AS IT MEASURES

For measuring problems that involve determining two variable dimensions . . . then combining them in a laborious calculation, Taft-Peirce engineers now offer a valuable new time-and-labor-saving tool. An air gage that does the whole job. Measures. Computes. And indicates the result instantly on a single dial.

Typical applications include determining deviation from desired degree of taper or angle . . . center distance without respect to hole size . . . parallelism or angularity of shafts or bores. And many others.

For example, the three Computing CompAIRators above indicate center distance, bend, and twist of connecting rods. They do the work of six standard indicators, eliminate human error, and save hundreds of man-hours every year.

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NAMES in the NEWS

Henry E Warren, general manager and secretary of Mac-it Parts Co, has been elected president of the company, succeeding the late **John S Cochran.** He is one of the three original founders of the company, which produced the first heat-treated screws on the market.

R J S Pigott has retired as director of engineering, Gulf Research & Development Co, but will continue his consulting work. He was president of ASME last year, and is past president of both Instrument Society of America and SAE. His latest patent is on Hi-Jet, a method of lubricating and cooling cutting tools.

Harold C Piper has been elected vice president in charge of manufacturing of the Borg-Erickson Corp, Chicago. He joined the company in 1936, and ten years later was appointed plant manager.

S E Biggs has been elected vice president, operations, Youngstown Steel Car Corp. He was formerly associated with Trailmobile Inc, as vice president in charge of manufacturing.

Solve Threading Problems on Die Castings . . . with

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CYLINDRICAL DIE THREAD ROLLERS

Smooth, precise threads rolled on die cast parts

. . . 1200 to 1800 per hour

Thread rolling is now accepted as the preferred method of producing uniform, accurate threads with smooth flanks on die castings. Most of the materials commonly used in die casting permit the threads to be more accurately formed by rolling than by other processes. Production efficiency is higher and thread rejections are rare. Quality control is simplified and inspection is limited usually to spot checking, even on the most precise threads.

Automatic hopper feeds are available for large production runs and where it is desirable for one operator to run several machines.

Send us specifications of your requirements and let us supply you with complete information.

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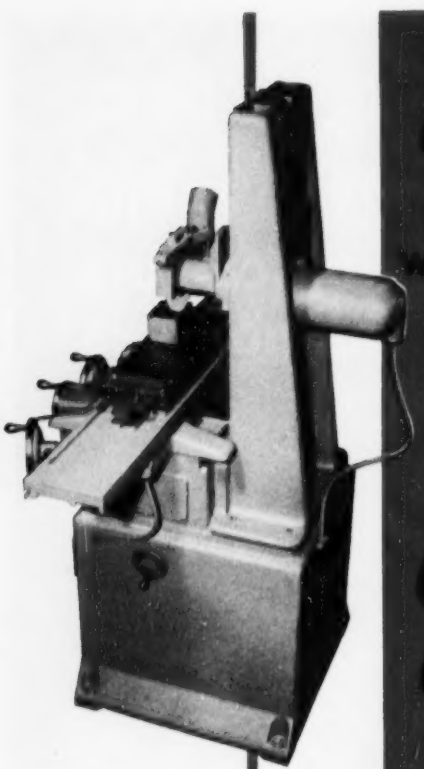

Integral strength WITH REID Column-on-base design

All mechanical units of the Reid Grinder are built around a rugged one-piece column casting mounted *on* a one-piece base, making the column an integral part of the grinder. This exclusive Reid feature insures permanent alignment of cross slide saddleways and vertical headways.

Designed for maximum rigidity, "stutter-free" Reid Grinders assure better surface finishes, minimize rejection of substandard work and reduce unit costs.

Don't let vibration rob your shop's efficiency — specify Reid Grinders for rugged dependability.

Let us show you the *complete* story on this and many other exclusive Reid features (the result of 53 years of experience).

Capacity: 6" x 18" x 15¼"
Work table: 51" x 8"
Power Feed, Table: 12-35 ft./min.
Standard Wheel: 7" x ⅓" x 1¼"
Floor Space: 70" x 36"
Weight: 2,000 lbs., crated 2,225 lbs.

Write *today* for your copy of our Bulletin 618-1.

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Leo J Pantas, general manager of Stamford Div, Yale & Towne Mfg Co, has been advanced to general manager, Yale Lock & Hardware Div of the firm. He will head a management group that will direct manufacturing in the four plants of the recently formed division. He has been manager of the company's Salem, Va, plant, and manager of the Buffalo plant.

Jackson Kemper has been elected vice president of the H K Porter Co, Pittsburgh. Mr Kemper will continue in his present capacity as general manager, Watson-Stillman Fittings Div, Roselle, NJ.

Van H Leichliter has been appointed vice president of operations of American Steel & Wire Co. He succeeds **Walter F Munford,** appointed president of the division of US Steel January 1. Mr Leichliter, who joined the firm in 1930, had been assistant vice president of operations during the past two years. **John A Slenker,** formerly district manager of operations for the Wire Div in Duluth, succeeds Mr Leichliter. **Harold Cope,** general supt in Donora, Pa, will take over Mr Slenker's post in Duluth.

D T Marvel has been named vice president, sales, of Olin Industries. He joined the organization in 1952 as sales manager of the Metals Div. Prior to that time he had been associated for a number of years with the National Tube Co, subsidiary of US Steel.

Stanley S Boyer, vice president and director of Bingham-Herbrand Corp, has resigned from his position. He has been with the company 36 years and through four ownerships, and is a former president of Herbrand Corp, the original company.

J F Knoff has been appointed vice president and general sales manager of the Chrysler Airtemp Div. Mr Knoff joined the company in 1945, and has been serving as general sales manager since 1951.

William E Judd, general sales manager of South Wind Div, has been appointed assistant to James S Knowlson, president and board chairman of Stewart-Warner Corp. He has been chief field engineer and assistant sales manager for his division. He fills the vacancy left when **Leonard L Robb** was appointed head of wholesale sales of Alemite lubricants and S-W instruments.

W W Greenway has been elected a vice president of Pressed Steel Car Co; he will make his headquarters in Los Angeles, where the company's newest acquisition, the Axelson Mfg Co, is located. Mr Greenway joined the firm's Mt Vernon Car Mfg Div in 1944 as production engineer, and later became production manager. He has most recently been serving as general manager of the Chicago Steel Tank Div.

Vinco is mass producing component parts for him

His full enjoyment of dinner at home is never spoiled by worries about component parts when Vinco is producing them. He knows the parts will be delivered as promised and will meet all specifications. This confidence is reflected by manufacturers throughout the metal working industry. As a result, Vinco has been forced to expand its production facilities. The next time you have parts to be machined to loose or close tolerances, call Vinco.

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SPLINE GAGES
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GEAR PUMPS

Formed Wheel Dressers, Automotive Cam Checkers, Optical Dividing Heads, Precisiondexes

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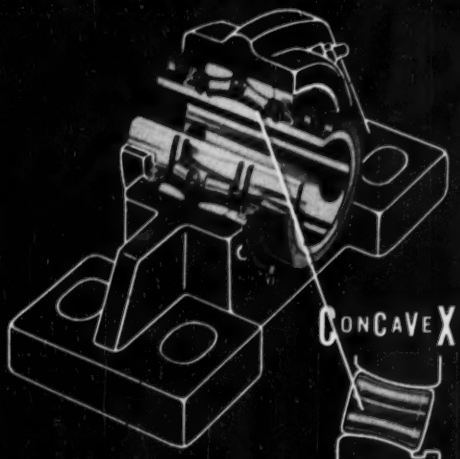
THE TRADEMARK OF DEPENDABILITY

MILLIONTHS OF AN INCH FOR SALE

THE First
AND STILL THE FINEST BEARING OF ITS KIND



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Originated by Shafer over 3 decades ago, ConCaVex is still the "years ahead" design in roller type bearings. It has met all challenges—shown all industry what the words "anti-friction-efficiency" really means!

This basically superior ConCaVex design combines in one bearing the distinct structural and operational advantages of both ball and roller type bearings. Installed in your product or your plant equipment Shafer ConCaVex Bearings will improve your ability to produce a quality product more efficiently at less cost. Ask for full information and engineering assistance. No obligation.

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HAVE RESERVE CAPACITY FOR SHOCK LOADS

HAVE AUTOMATIC SELF-ALIGNMENT

WITHSTAND GREATER THRUST LOADS

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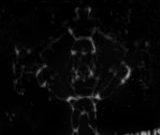
STAY STRONGER YEARS LONGER



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YESTERDAY'S PIONEER • • • TODAY'S LEADER

CHIPS CURL OUT INSTEAD OF CLOGGING with
WELDON
CUPPED-END END MILLS

BETTER PERFORMANCE . . . LONGER TOOL LIFE

Over twenty-five years ago Weldon opened the door to higher speeds and faster feeds by developing a scientifically designed end mill tooth. This hollow ground tooth with its curved cutting face allows the chips to *curl* out without clogging. A further means to this purpose is the Weldon "cupped-end" which prevents chips from clogging the teeth ends because it eliminates pockets which trap chips.

Another special feature originated by Weldon is the double back-off on the tooth, which gives greater support to the cutting edge, prolonging the life of the tool.

Weldon distributors throughout the U. S. A. and Canada carry complete stocks to serve you.

THE WELDON TOOL COMPANY
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Hunter Michaels has been appointed vice president, operations, of American Locomotive Co; he formerly served as director of the Railway Steel-Spring Div. **D W Cameron**, formerly assistant manager of the Schenectady plant, has been named vice president, manufacturing. **Manuel Alonso,** manager of foreign sales for the past two years, has been appointed vice president in charge of that division.

Harry W Wallace has been elected president of Wheel Trueing Tool Co of Canada, Ltd, subsidiary of the Detroit company. Mr Wallace has been serving as vice president and general manager of the Canadian plant and vice president in charge of the Diamond Drilling Div of the American and Canadian plants.

George A Gade has been named vice president in charge of sales for Standard Pressed Steel Co. Mr Gade joined the company in 1939; in 1950 he was appointed manager of outside sales, and last April was elected a director of the company.

Distributors Named

Charles W Carter Co, Los Angeles, is now West Coast distributor for Warner Electric Brake & Clutch Co products.

Roche & Hull, Inc, Baltimore, has has been named distributor for Allis-Chalmers pumps in portions of Delaware, Maryland, Virginia, West Virginia.

A Milne & Co, New York, has opened a sales office at 833 East Kilborn St, Milwaukee, for sale of solid and hollow tool steels.

Carl E Swift has been appointed Southern California distributor for Producto Machine Co's line of dowel pins.

L Norris Hall, Inc, Philadelphia, will shortly begin construction of a low-carbon steel warehouse at Wilmington, Del, to service the Wilmington-Chester-South Jersey area.

Sales & Service Machinery Co, Philadelphia, has been named exclusive distributor of Rockford Machine

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72% SAVING IN METAL!
80% INCREASE IN PRODUCTION!
UNIQUE BALANCE CO. INC.

Typical results by every user of
NILSON 4-SLIDE
Wire and Ribbon Metal
FORMING MACHINES

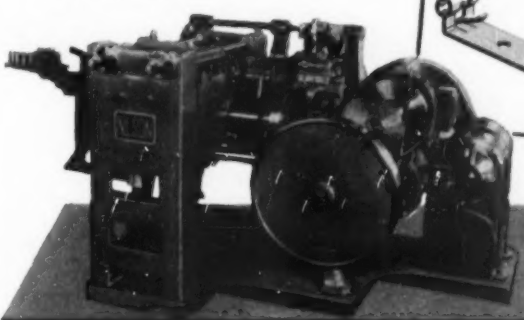
Plants from coast-to-coast are setting new production records with NILSON 4-SLIDE MACHINES . . . and experiencing tremendous economies and greatly improved quality.

Are you confronted with a keen competitive situation? Take the advice of hundreds of plant supervisors . . . install NILSON MACHINES and enjoy these economies *at once.*

NILSON combination press and 4-SLIDE forming machines take the stock directly from the coil — feed, straighten, pierce, blank, swage, stamp, coin — perform up to 5 forming operations and cut off . . . all in one quick, precise operation AUTOMATICALLY!

USING A NILSON COMBINATION PRESS AND 4-SLIDE FORMING MACHINE

Unique Balance Co., Inc. (one of the largest manufacturers of sash balance equipment), now produces 71,532 more parts out of the same amount of steel, compared to their former method. Production speeds increased from 100 to 180 pieces per minute.



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THE A. H. NILSON MACHINE CO.
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Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

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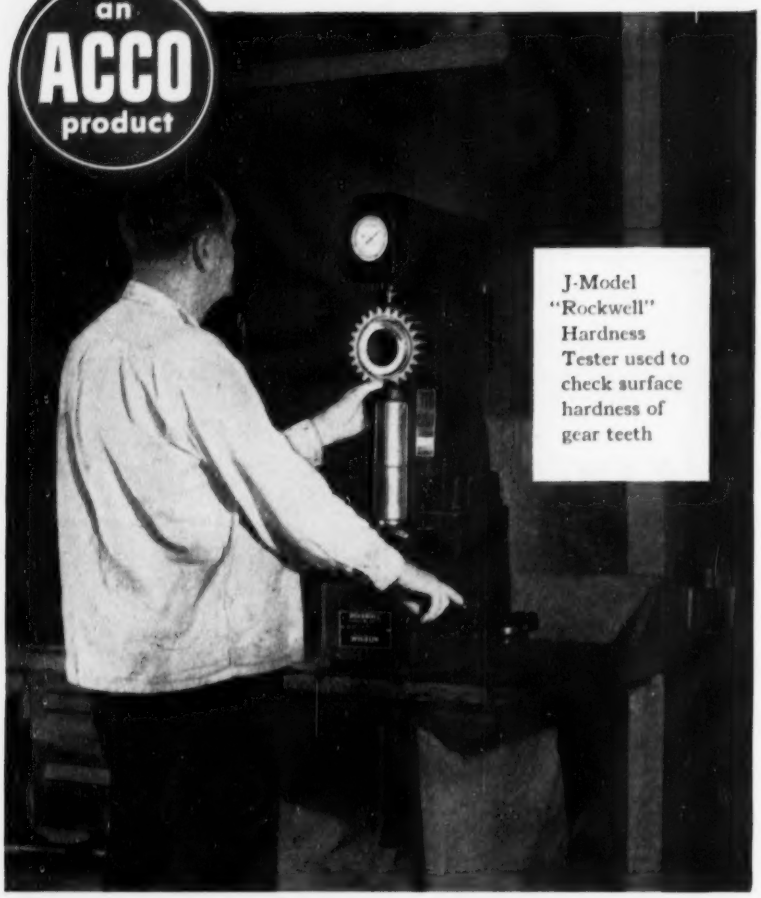


J-Model "Rockwell" Hardness Tester used to check surface hardness of gear teeth

How "ROCKWELL" Hardness Testers Reduce Customer Complaints

● Surface hardening of wearing parts makes them last longer but it is a job requiring skill and precision. The eye cannot detect inaccuracies but a WILSON "ROCKWELL" hardness test leaves nothing to chance.

The WILSON "ROCKWELL" Hardness Tester is a precision instrument with totally enclosed "Zerominder" dial, gripsel clamp screw for quick change and proper seating of penetrator, conveniently grouped controls, enclosed variable speed dash pot, and standardized weights.

Regular and Superficial WILSON "ROCKWELL" Hardness Testers come in many styles with accessories for testing flats, rods, rounds, odd shapes.

There is the WILSON TUKON for micro-indentation hardness testing. Write for literature.

*Trade Mark Registered

ACCO

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and TUKON Hardness Testers

Tools in eastern Pennsylvania, southern New Jersey and Delaware.

Aluminum Distributors, Inc, Chicago, will handle Reynolds Aluminum Mill Products in that area. The distributor can furnish less-than-carload service on sheet, plate, wire, rod, bar, extruded shapes, etc.

Clair L Martin Co, Indianapolis, is the new Indiana representative for Homestrand, Inc's line of Swedish measuring instruments.

Dayton Supply & Tool Co, Inc, Dayton, Ohio, will distribute General Electric's complete line of Carboloy tools and blanks, diamond wheel dressers.

Cleco Div, Reed Roller Bit Co, announces appointment of the following area distributors for its line of air tools and accessories: H B Bighouse Co, Newark, NJ; Nixon Machinery Co, Nashville, Tenn; Swing Machinery & Equipment Co, San Antonio; and San Antonio Machinery & Supply Co, Waco, Texas.

Murray-Baker-Frederic, Inc, New Orleans, will distribute Pennsylvania Flexible Metallic Tubing Co's line of flexible metallic hose in the New Orleans-Mobile-Baton Rouge-Jackson area.

John Cheney of Mercer Island, Wash, has been named sales representative for J H Williams & Co, Buffalo, in its Washington, Oregon, Idaho and western Montana territory.

Valley Equipment & Supply Co, Burbank, Calif, will distribute Allis-Chalmers motors, controls, transformers and drive equipment in Los Angeles county.

"Sinclair Autokut® PT provides Better Finish"

... says **Ralph Ragan, President, Ragan Ring Company**

The Textile Rings that the Ragan Ring Company of Atlanta, Ga., manufactures must have the best surface finish possible to insure uniform yarn production at extremely high speeds.

To make these rings from very hard, cold drawn seamless tubing, Ragan Ring uses Sinclair AUTOKUT PT oil.

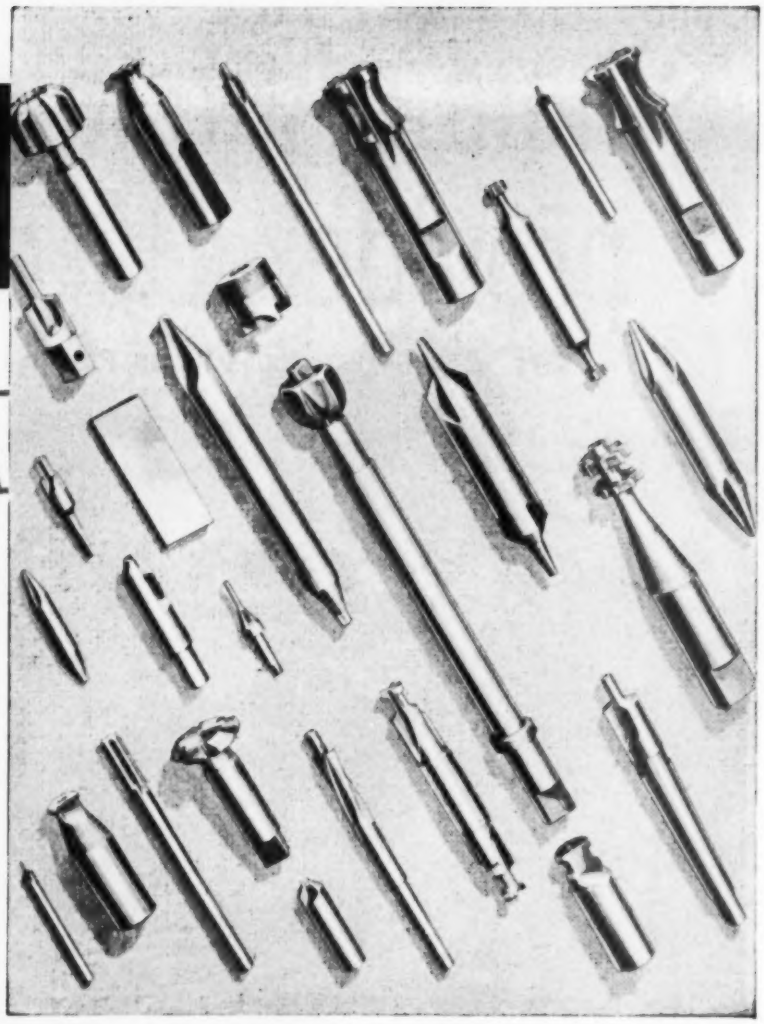
President Ralph Ragan says, "After having tried various combinations of cutting compounds, we found that AUTOKUT PT provides better finish of rings and longer tool life, and therefore, better economy.

"It's one of the best we have used . . . and I personally recommend it without qualifications."

Perhaps a Sinclair Lubrication Engineer can help you with your metal cutting problems. Call your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR CUTTING OILS and COOLANTS
for metal working

FINE-EDGE CUTTERS



Want high

Edge Strength?

You can get it

with DBL-2 HIGH-SPEED STEEL

Write for copy of

"CUTTING TOOL MATERIALS"

Allegheny Ludlum produces *all* types: the various tungsten and "moly" high-speed steels, cast-alloy materials, and cemented carbides. This 36-page booklet analyzes and compares types, and covers grade selection, etc.—invaluable data for production men. *Write for your copy.*

ADDRESS DEPT. AM-38

A midwestern tool manufacturer, specializing in fine-edge cutting tools, has found DBL-2 *best* for their purpose—added proof of the high edge strength and excellent cutting qualities of this high-speed steel.

DBL-2 (typical analysis: C .80, W 6.00, Mo 5.00, Cr 4.00, V 1.75) represents the 6-6-2 or M-2 type of tungsten-molybdenum high-speed steel. DBL-2 combines high hardness with toughness. Requiring no more than reasonable care in hardening and tempering, you will find it a high-speed steel of great possibilities—capable of giving you performance equal to, or better than, the general-purpose tungsten types, and at reduced cost.

DBL-2 reliability has been proved in a wide variety of cutting tools. Let us help you to use DBL-2 . . . our Mill Service Staff is at your command.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

WAD 9839

AL FINE TOOL STEELS SINCE 1854

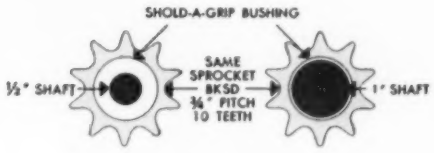
Here's what you've wanted . . .

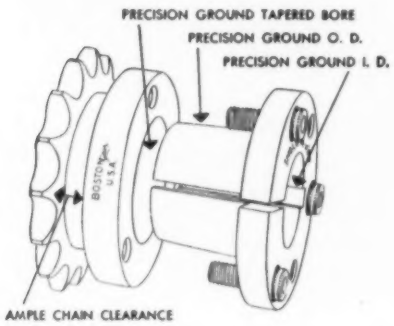
in interchangeable sprocket assemblies

- Better Design
- Broader Size Range
- Slip-Proof Grip
- BOSTON Gear Quality

The New SHOLD-A-GRIP®

INTERCHANGEABLE TAPERED BUSHINGS





Accomodates MORE Sprocket Sizes

In the SHOLD-A-GRIP Sprocket, holes for fastening set screws are in the shoulder. Thus, no metal is cut from the sprocket itself. This assures maximum strength, and permits cutting a minimum number of teeth with a maximum size bore. SHOLD-A-GRIP Sprocket Pinions can be fitted to a wider range of shaft sizes — from ½" to 2½" — easily and quickly with SHOLD-A-GRIP Bushings.

Permits Use of SMALLER Sprocket Pinions

The unique shoulder construction brings smaller sprockets into the interchangeable class. For example, Sprocket BKSD ¾" Pitch with 10 teeth can be used on any size shaft from ½" to 1" by inserting the correct size SHOLD-A-GRIP Bushing.

Gripping Power Exceeds Chain Strength

PRECISION-GRINDING of tapered bore of SHOLD-A-GRIP Sprocket, and of inside and outside diameters of SHOLD-A-GRIP Bushing assures:

1 Equalized gripping power the entire length of bushing (even if shaft is not to size).

2 Maximum gripping power. Tests show CHAIN WILL BREAK before SHOLD-A-GRIP will SLIP.

Look over the SHOLD-A-GRIP, and see why it is your best buy. Get complete details...ask your BOSTON Gear Distributor, or write for the new SHOLD-A-GRIP folder. Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

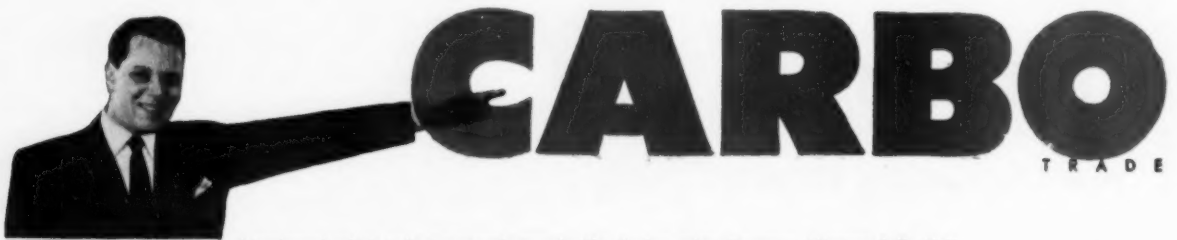
BOSTON Gear

POWER TRANSMISSION PRODUCTS

OVER 5000 STOCK ITEMS

OFF-THE-SHELF DELIVERY FROM STOCK AT YOUR NEARBY BOSTON GEAR DISTRIBUTOR

We have just one axe



"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N. Y.

to grind . . . YOURS !

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take snagging, for instance. With abrasives there are at least 9 different ways to remove stock at high rates. That means the odds are 9 to 1 there's a better, lower cost way than the one you're using now. How can you be *sure?* By asking CARBORUNDUM...for CARBORUNDUM alone has a complete, branded line of grinding wheels *and* abrasive belts *and* tumbling and polishing grains...and only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or suppose you're manufacturing shears . . . you must remove scale with tumbling nuggets—finish with abrasive belts—sharpen with grinding wheels—polish with abrasive grain. CARBORUNDUM alone can give you *one-source control* of abrasive quality, on every type of abrasive you use...quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

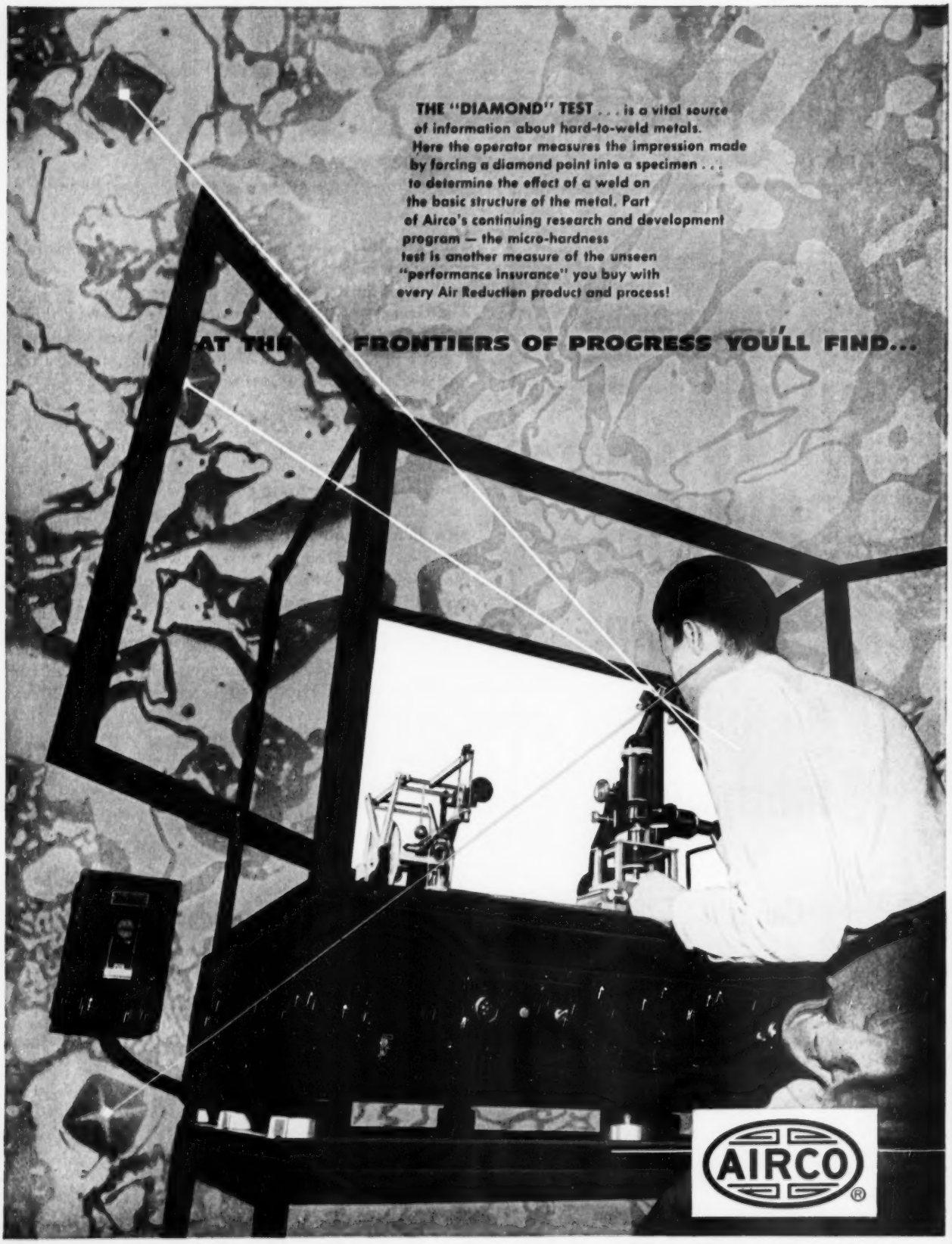
He's your best bet for complete stocks, prompt delivery...and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog...containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today.

RUNDUM

MARK

. . . the ONLY source for EVERY abrasive product you need


THE "DIAMOND" TEST . . . is a vital source of information about hard-to-weld metals. Here the operator measures the impression made by forcing a diamond point into a specimen . . . to determine the effect of a weld on the basic structure of the metal. Part of Airco's continuing research and development program — the micro-hardness test is another measure of the unseen "performance insurance" you buy with every Air Reduction product and process!
AT THE FRONTIERS OF PROGRESS YOU'LL FIND...
AIRCO

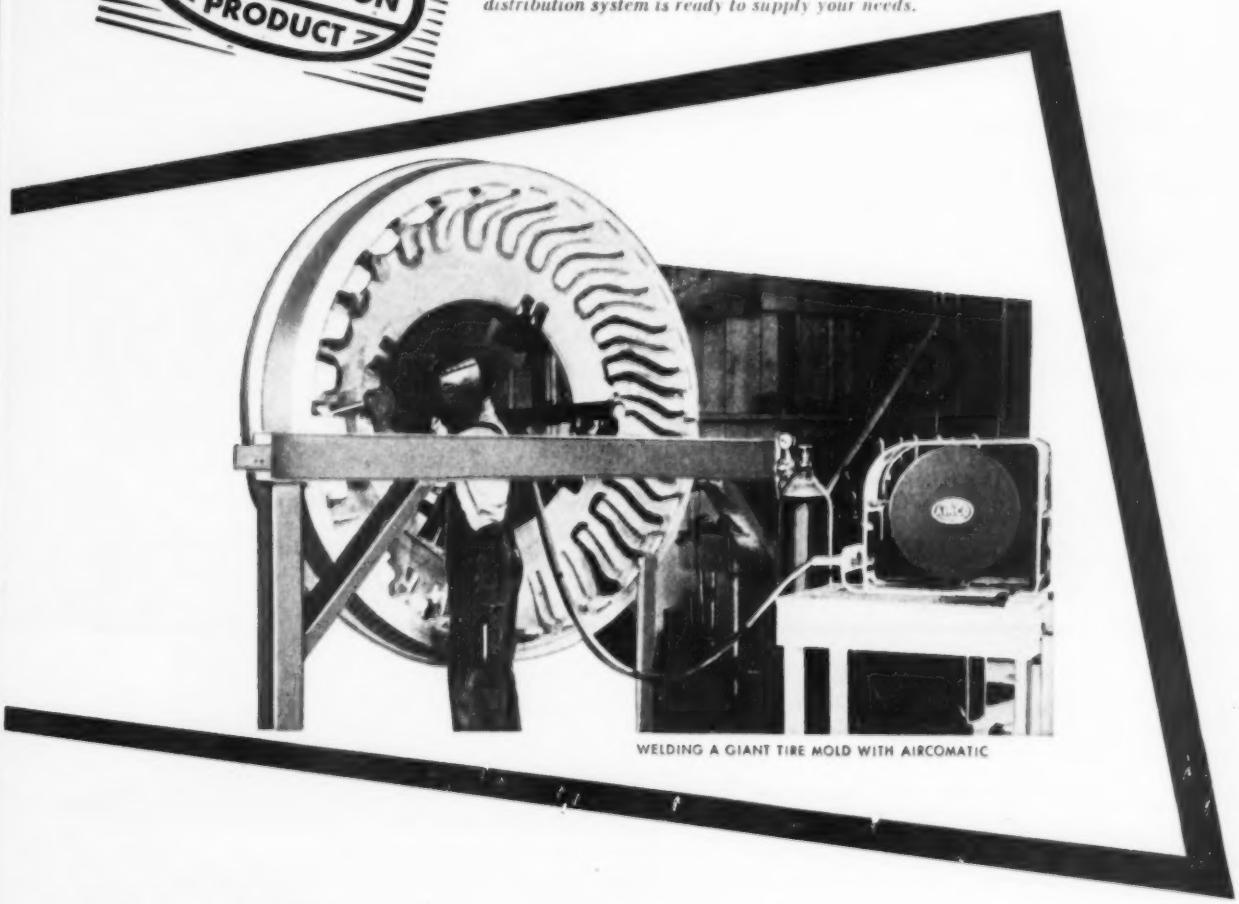
OXYGEN • ACETYLENE • INDUSTRIAL AND RARE GASES • CALCIUM CARBIDE • WELDING SUPPLIES AND ACCESSORIES

"welding" a perfect tread...

AIRCOMATIC® inert gas welding once again demonstrates its ability to handle problem metals in this unique application. A prominent manufacturer of aluminum molds for recapping tires ran into "tread trouble" when attempting to cast tread lugs into the doughnut-shaped tire matrix. Clearance between lug and matrix left an unsightly rubber "fin" on the finished product. The Aircomatic process eliminated this problem with clean, non-porous welds . . . at the same time speeding production through its high-rate deposition of filler metal. No flux was necessary . . . no slag removal . . . minimum "clean-up" on the finished matrix.

... AN AIR REDUCTION PRODUCT

And remember, when you need oxygen, acetylene, other industrial or rare gases, think of Air Reduction. A nation-wide distribution system is ready to supply your needs.



WELDING A GIANT TIRE MOLD WITH AIRCOMATIC

AIR REDUCTION

DEALERS AND OFFICES IN MANY PRINCIPAL CITIES

60 East 42nd Street • New York 17, N. Y.
Air Reduction Sales Co. • Air Reduction Magnolia Co. • Air Reduction Pacific Co.
Represented Internationally by Airco Company International
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• OXYACETYLENE WELDING AND CUTTING APPARATUS • ARC WELDING AND INERT-GAS ARC WELDING EQUIPMENT

Prove to yourself that
You Can Get More Welds Per Dollar

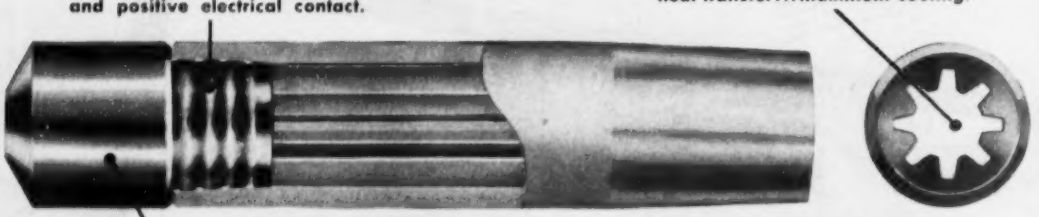
How? Give your Mallory distributor a call and ask him to drop by with some of our replaceable "Nu-Wrinkle Cap"* electrodes for you to examine. Have him leave a few for you to try out in your shop. Then you'll see what we mean when we say "more welds per dollar".

Nearly two years of experience in shops all over the country has proven that the performance of Mallory "Nu-Wrinkle Cap" electrodes compares favorably with that of conventional one-piece electrodes . . . in addition to reducing unit costs. Time after time . . . experience has shown that with good welding practices, many manufacturers have effected substantial savings by using 20 to 25 "Nu-Wrinkle Cap" electrodes before replacing a shank. As a matter of fact, one manufacturer used 75 caps on a single shank.

HERE IS WHAT THEY LOOK LIKE . . .

Corrugations in shank insure effective mechanical attachment and positive electrical contact.

Fluted water holes assure rapid heat transfer . . . maximum cooling.



Small, inexpensive replaceable cap is easy to insert and remove from the fluted reusable shank.

All standard Mallory nose shapes are available.

HERE IS HOW THEY WORK . . .

"Nu-Wrinkle Caps" seat easily and securely in the shank. Under normal welding pressures they are seated by the operation of the welding machine.

The cap can be quickly and easily removed with special Mallory pliers that are designed to remove caps from both No. 1 and No. 2 Morse taper shanks.

Along with "Nu-Wrinkle Cap" electrodes, your Mallory distributor carries a complete stock of standard Mallory welding supplies for your convenience. It is another one of the ways you can . . .

Expect more . . . Get more from **P. R. MALLORY & CO. Inc. MALLORY**

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario.

RESISTANCE WELDING ELECTRODES, HOLDERS, DIES, RODS AND BARS, CASTINGS, FORGINGS

*Trade Mark, Patent Pending

P. R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
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P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium development, contact Mallory-Sharon Titanium Corp., Niles, Ohio

The trend is to more stampings with BLISS *Presses*

Largest knuckle-joint press in the world: bed area of 60" x 70", 40-inch die space, and six-station Bliss ratchet dial feed, 59" dia., with electrical protection for safer indexing.

Bliss builds world's largest knuckle-joint press for Regal Ware, Inc.

When Regal Ware, Inc., Kewaskum, Wis., needed a press to coin cups for artillery shell cases, one press builder recommended a 6000-ton hydraulic. Bliss, who builds both mechanical and hydraulic types, found that a 4000-ton knuckle-joint press would not only deliver higher production but would also cost much less.

Result: Bliss created the largest knuckle-joint press ever built, a giant standing 34 feet and weighing 305 tons.

Regal Ware's experience is a good example of how press buyers can count on Bliss' unbiased recommendations. For Bliss builds more types and sizes of mechanical and hydraulic presses than any other manufacturer. Call in your nearby Bliss sales engineer today.

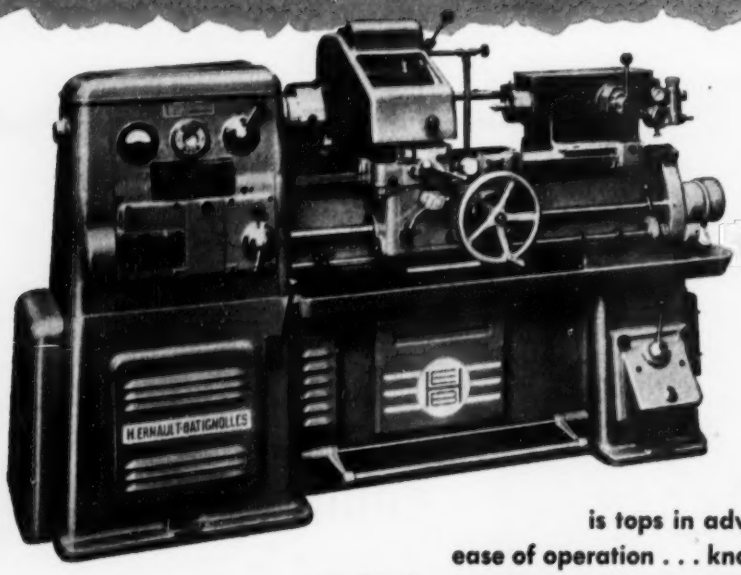
E. W. BLISS COMPANY, CANTON, OHIO
E. W. Bliss (England) Ltd., Derby, England
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. **West Coast Representatives:** Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Co., Seattle. **Other dealers** in United States cities and throughout the world.

Bliss on your press is more than a name ...it's a guarantee!

Production tested and approved in over 1,000 plants



HIGH SPEED HYDRAULIC COPYING LATHE

Those who have *compared* copying lathes know the H.E.B. is tops in advanced design, construction and ease of operation . . . know that the H.E.B. means faster, trouble-free production with better finish, no distortion of the work.

The H.E.B. Copying Lathe has higher spindle speeds—up to 3600 RPM in the **OP Models** to take full advantage of carbide. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

You won't find *chips* any problem at all. A sloping bed together with a built-in coolant pump result in automatic wash-away of the chips into a rear pan, from which they are easily removed *without stopping the machine.* Featured too are the power operated back tool posts which are part of the standard machine.

Remember, the H.E.B.'s patented copying device is an integral part of this ruggedly constructed lathe, resulting in rigidity and accuracy. Setting time is reduced to a handful of minutes, and finished parts are copy-turned up to 300% faster than on multi-tool lathes.

Designed and built in France by H. Ernault Batignolles—machine tool manufacturers for almost a hundred years!

If you are planning to make an investment in a copying lathe you want the best . . . Study our insert in Sweet's Machine Tool Catalog—Or write or phone us for detailed catalog or a demonstration!

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

•

Specially designed for carbide tools without attachments. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels are mounted on the wheel head, and each may easily be brought into position.

H·E·B
"THE WAY TO TURN"

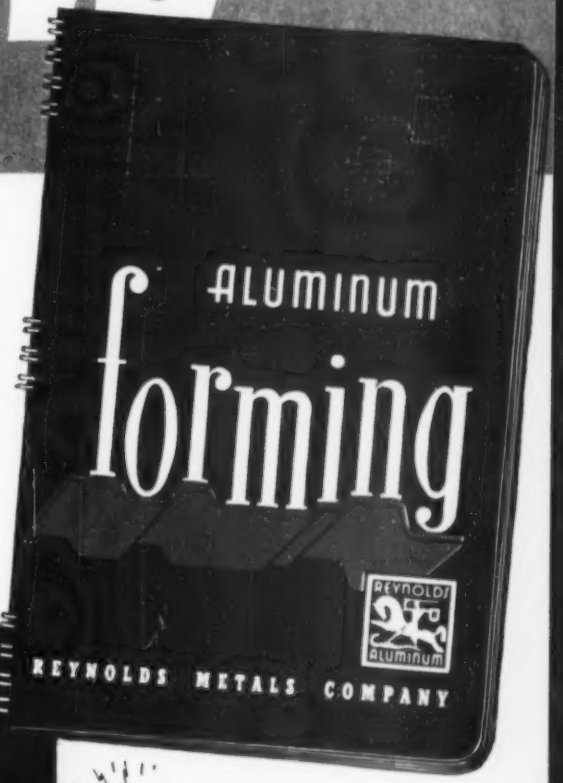
IMMEDIATE DELIVERY

H. E. B. MACHINE TOOLS, INC.
475 FIFTH AVENUE • NEW YORK 17, N. Y.
Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

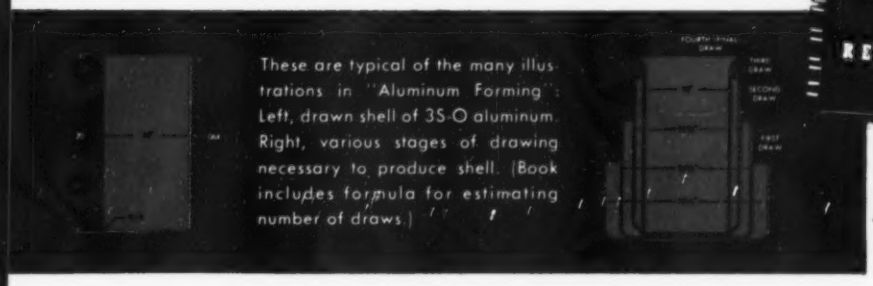
"ALUMINUM FORMING"

Technical Handbook



Write Today! Free when requested on business letterhead.

Everyone who works with aluminum should have this new 148 page handbook, the latest addition to the Reynolds Technical Library. "Aluminum Forming" was published so that design engineers and plant supervisors could have, in a single volume, complete information on the proper techniques for working aluminum. Design and fabricating practices with aluminum are not always like those for other metals. So, in some cases modifications or even special procedures may be required. This handbook fully explains all these procedures and includes more than two hundred and thirty drawings and photographs, twenty-two tables and thirty-two formulas.



These are typical of the many illustrations in "Aluminum Forming": Left, drawn shell of 3S-O aluminum. Right, various stages of drawing necessary to produce shell. (Book includes formula for estimating number of draws.)

Be sure to see "Mister Peepers" every Sunday Night, 7.30 EST, NBC-TV; hear "Fibber McGee and Molly" every Tuesday night, 7.30 EST & PST, NBC radio.

For your free copy of the valuable Forming handbook plus a complete index of Reynolds technical literature, write on business letterhead (otherwise price of book is $1.00). Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

Here's a man to welcome...

Your nearby Reynolds Aluminum Distributor

Reynolds is putting forth every effort to ease your aluminum-buying problems. To meet the growing demand for this vital metal, Reynolds Metals Company and other U.S. producers are rapidly expanding production. Reynolds alone will have increased production to 829 million pounds by 1953.

To meet your immediate problems the nearby Reynolds distributor is doing his level best to fill orders from present stocks.

You can also count on his assistance and guidance in selecting temporary alternate materials. He will apply all of his experience and energy to help you out. He is a man you ought to know. Now as always he will give you the kind of service you need and want.

YOUR REYNOLDS DISTRIBUTOR IS LISTED BELOW

ALABAMA
Arnold-Brown Metals & Supply Co., Birmingham
Southern States Iron Roofing Co., Birmingham

CALIFORNIA
Clingan & Fortier, Inc., Fresno, San Francisco and Vernon (Ingot also)
Bucla Metals, Inc., Los Angeles
Ira-Holbrook, Inc., San Francisco
Union Hardware & Metal Co., Los Angeles
United States Steel Supply Div., Los Angeles
Western Metal Supply Company, San Diego

COLORADO
Marsh Steel Corporation, Colorado Springs and Denver
Salt Lake Hardware Co., Grand Junction

CONNECTICUT
American Steel & Alloys Corp., Hartford

DISTRICT OF COLUMBIA
Lyon, Conklin & Co., Inc., Washington

FLORIDA
Horne-Wilson, Inc., Jacksonville, Miami, Orlando and Tampa
Southern States Iron Roofing Co., Jacksonville, Miami, Orlando and Tampa

GEORGIA
Southern States Iron Roofing Co., Albany, Atlanta, Augusta and Savannah

IDAHO
Salt Lake Hardware Co., Boise

ILLINOIS
J. G. Braun Co., (Architectural only) Chicago
Hipi Metals Corp., (Ingot only) Chicago
United States Steel Supply Div., Chicago
Benjamin Wolff & Co., Chicago

INDIANA
Hubbell Metals Inc., Indianapolis

KENTUCKY
Southern States Iron Roofing Co., Louisville

LOUISIANA
Southern States Iron Roofing Co., New Orleans

MARYLAND
Clendenin Bros., Inc., Baltimore
Lyon, Conklin & Co., Inc., Baltimore

MASSACHUSETTS
Bay State Refining Co., (Ingot only) Chicopee Falls
Arthur C. Harvey Company, Boston
Pratt & Inman, (Wire, rod, bar, structurals) Worcester

MICHIGAN
Rasle Steel Corporation, Detroit
McDonnell Bros., Inc., (Architectural only) Detroit
Milton A. Meier Co., (Ingot only) Detroit and Grand Rapids

MINNESOTA
Vincent Brass & Copper Co., Minneapolis

MISSOURI
Hubbell Metals Inc., North Kansas City and St. Louis
Marsh Steel Corporation, North Kansas City

NEW JERSEY
Barth Smelting Corp., (Ingot only) Newark
Edgcomb Steel Corporation, Hillside

NEW YORK
Barth Smelting Corp., (Ingot only) Newark, N. J.
J. G. Braun Co., (Architectural only) New York
Edgcomb Steel Corporation, Hillside, N. J.
Rochester Smelting & Refining Co., (Ingot only) Rochester

NORTH CAROLINA
Southern States Iron Roofing Co., Raleigh

OHIO
The Atlas Metal Co., (Ingot only) Cleveland
G. A. Avril Smelting Corp., (Ingot only) Cincinnati
The Hamilton Steel Co., Cleveland
Mutual Manufacturing & Supply Co., Cincinnati
Vorys Brothers, Inc., Columbus

OKLAHOMA
Vinson Supply Co., Tulsa

OREGON
Woodbury & Company, Coos Bay, Eugene, Medford and Portland

PENNSYLVANIA
Atlas Steel Service Co., Philadelphia
Levinson Steel Sales Company, Pittsburgh
Meacham & Evans Co., Philadelphia
Penn-Farrington Company, Philadelphia

SOUTH CAROLINA
Southern States Iron Roofing Co., Columbia

TENNESSEE
Southern States Iron Roofing Co., Memphis and Nashville

TEXAS
Bonnell-Lenoir Mfg. Co., Dallas, Harlingen, Houston, Lubbock, San Antonio and Temple
Vinson Supply Co., Dallas, Odessa and Snyder

UTAH
Salt Lake Hardware Co., Salt Lake City

VIRGINIA
Southern States Iron Roofing Co., Richmond

WASHINGTON
Joseph T. Ryerson & Son, Inc., Seattle and Spokane
Clingan & Fortier, Inc., Seattle

WISCONSIN
Benjamin Wolff & Co., Milwaukee

Look Under "Aluminum" In Your Classified Telephone Directory

11-18-52

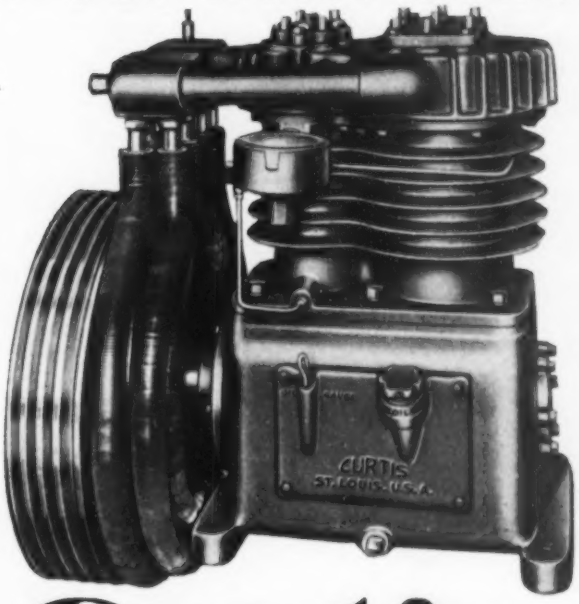
REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

MORE AIR Per Horse Power

- IT'S TWO-STAGE
- IT'S AIR COOLED
- SELF OILING



The New Curtis

MODEL 98 AIR COMPRESSOR

TWO-STAGE AIR COOLED 15 AND 20 HORSEPOWER

TWO-STAGE — More air per kilowatt hour, assuring savings in power bill.

AIR-COOLED — No expensive water bills; eliminates plumbing installation costs.

INTERCOOLER — Four section, finned, providing unusually effective cooling between stages; cooled by cyclone of air from fan flywheel.

SELF OILING — Simple, positive centro ring method; provides pressure lubrication of connecting rod and pistion pin bearings.

TWO TIMKEN MAIN BEARINGS — Tapered rollers; provide easy adjustment made externally without dismantling compressor.

VALVES — Readily removable as assembled units without removing cylinder head or breaking pipe connections or gasket joint.

CRANKSHAFT — Counterbalanced, drop forged — two main bearings — no overhung bearing.

PRECISION WORKMANSHIP — Assures long life and minimum maintenance.

EXPERIENCE — Backed by 99 years of manufacturing — assures you dependable, troublefree service.

Available as a simple compressor or base mounted — motor driven.

LET ONE MAN DO THE WORK
with this Curtis air-operated equipment.

AIR CYLINDERS — for almost any pushing, pulling or hoisting operation.

AIR HOISTS — for low-cost lifting or lowering of materials or machines.

-726

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Co.
1924 Kienlen Avenue, St. Louis 20, Mo.

I am interested in items checked below:

☐ THE NEW MODEL 98 ☐ AIR HOISTS ☐ AIR CYLINDERS
☐ AIR COMPRESSOR

Name.....

Firm.....

Street.....

City.....Zone....State.....

CURTIS PNEUMATIC MACHINERY DIVISION of Curtis Manufacturing Company
1924 KIENLEN AVENUE ST. LOUIS 20, MO.

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more-than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

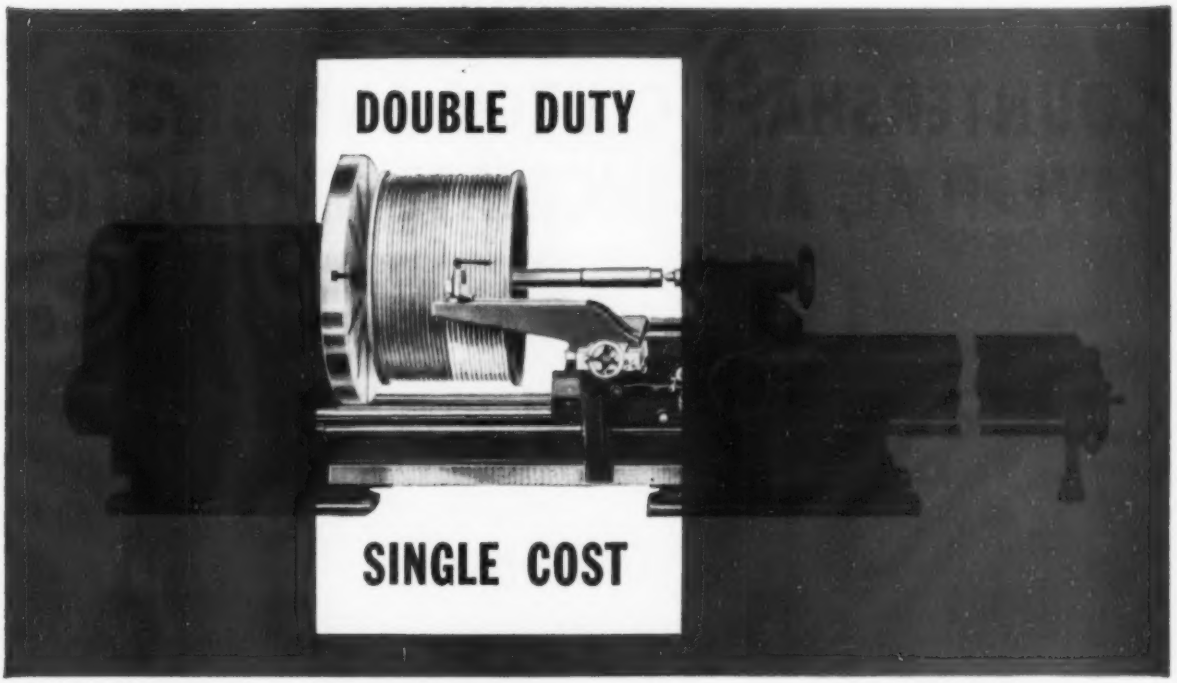
what are your

requirements for hydraulic pumps?

- If you need **PROMPT** delivery to expedite production . . .
- If you need **PUMP** delivery from .4 to 40 gallons per minute . . . at operating pressures up to 1000 p.s.i. (in some sizes, 1200 continuous, 1500 intermittent) . . .

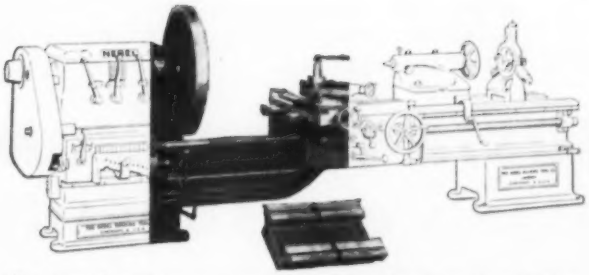
hydraulic pumps

GEROTOR MAY CORPORATION, BALTIMORE 3, MARYLAND



the Nebel extension bed gap lathe

with its flexible swing and center distance capacity
with its tremendous power, wide range of speeds and feeds
with its Nebel-built accuracy . . . offers the productive
capacity of two ordinary lathes for the price of one.
Made in two sizes: 20″/40″ and 28″/50″.
Write today for complete information

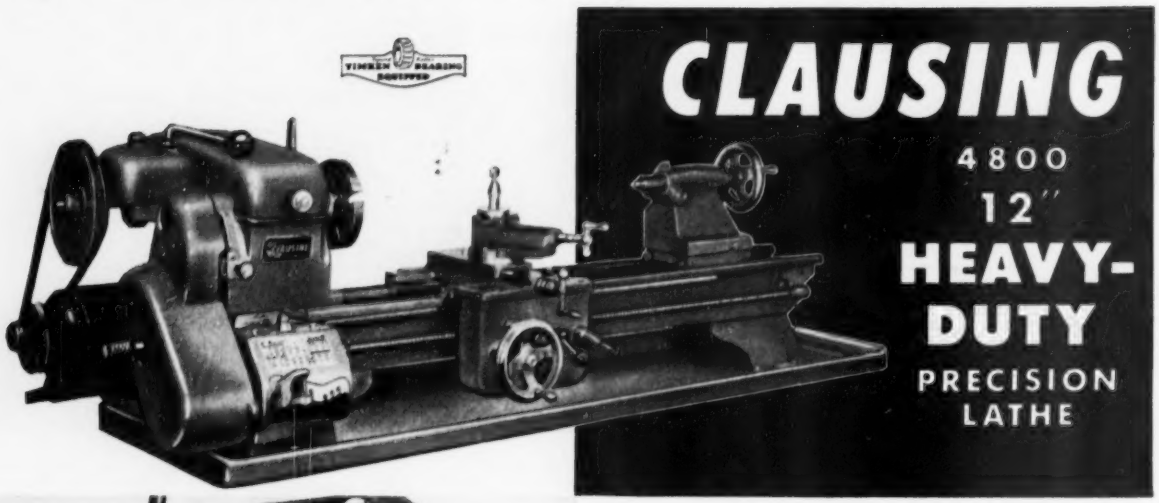


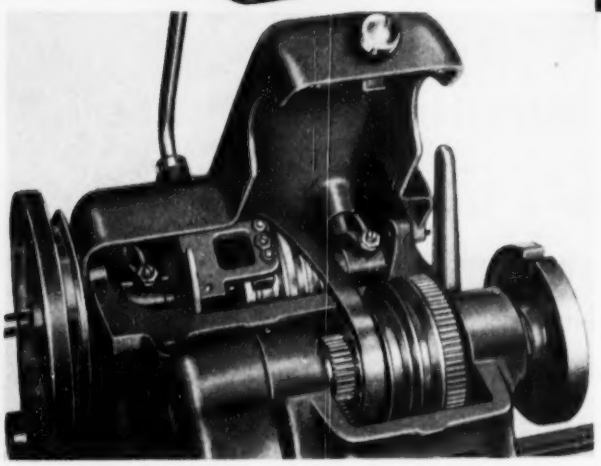
Increased swing capacity plus standard engine lathe advantages are yours with Nebel removable block gap lathes. Sizes: 18″/27″, 20″/30″, 25″/40″.

Nebel

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U.S.A.
WORKHORSE OF THE METAL WORKING SHOP SINCE 1899

COUNTERSHAFT CLUTCH AND BRAKE SAVE TIME, AND INCREASE PRODUCTION





Built-in countershaft — friction clutch and brake equipped — turns on precision ball bearings. Moving clutch lever to right engages spindle drive — to the left disengages it — to the extreme left tightens brake, stops spindle.

This Clausing lathe has a built-in countershaft with friction clutch and brake that permit instant starts and stops of the headstock spindle without stopping the motor. You step up production, save many costly minutes every day with a Clausing heavy-duty precision lathe.

And this is but *one* of the many extra-value features you get with a Clausing. Others include Timken tapered roller bearing equipped spindle; wide heavy bed with Vee-ways and flat ways precision ground; automatic apron with splash lubrication; complete V-belt drive; massive construction — 36" between center lathe weighs 535 lbs.

Prices start at $420.00! The Clausing 4800 is truly the greatest 12-inch lathe value. For complete details, see your dealer or write for catalog for additional information.

Atlas CLAUSING PRECISION MACHINE TOOLS DIVISION ATLAS PRESS COMPANY KALAMAZOO MICHIGAN U.S.A.

CLAUSING DIVISION
ATLAS PRESS COMPANY
2-101 N. PITCHER ST., KALAMAZOO, MICH.

Stop using "CUT and TRY" methods!

Guarantee your finish and size with a

RIVETT 918 Steelway Cabinet Lathe

FEATURES for more precision work

- **Instant selection of 90 to 3750 R.P.M. cutting speeds with convenient control and dial indication.**
- **Self-aligning slide rest automatically squares itself with line of centers.**
- **Double bevel steel ways, precision ground, provide positive centering action.**
- **Collets, with spacing of bearings doubled, have greater precision and gripping power.**
- **Lever chuck closer may be furnished with "one motion" control for collet, spindle drive and brake.**

Snug up to a Rivett 918 and with confidence turn, face or bore to your exacting tolerance—thrill with the knowledge that you are duplicating parts within "tenths".

The speed range and tool rigidity combined with the inherent precision of the 918 assures finish and size—perfect for second operations and toolroom work.

Use a lathe consistent in size with the work to be done—save on the initial expense and continue to save with each piece produced with less effort and without rejection.

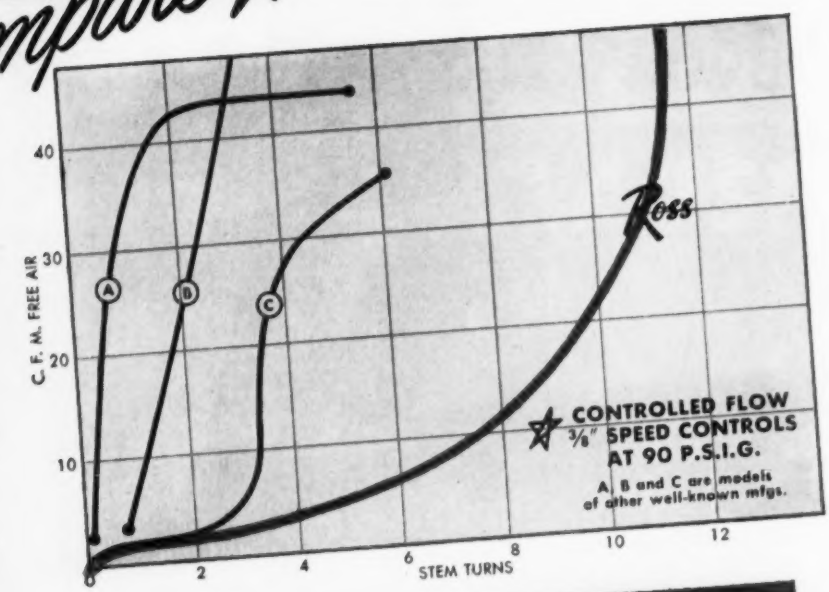
Write for bulletin 9185L. Proof of what the 918 will do for you is shown in this 20 page book.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR 3, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

Compare ☆



☆ Free flow capacity of the Ross Speed Control Valve is 25% TO 125% GREATER.

ROSS

Speed Control Valve

☆ Easy-to-adjust control flow

☆ Maximum free-flow

☆ Simple, dependable, rugged

☆ Small, lightweight

Write for complete details.

ROSS Control VALVES

ROSS OPERATING VALVE COMPANY

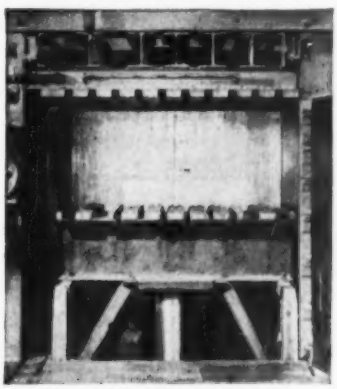
120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

Now! Large diameter centrifugally cast tubing

Available from FRASSE Warehouse Stock

ACIPCO steel tubing, centrifugally cast, is now available from Frasse in sizes ranging from 2″ to 50″ O. D., wall thicknesses of ¼″ to 4″, in lengths up to 16 feet. The more popular sizes are immediately available from stock. Other sizes and analyses (in quantities as little as 16 feet) can be made to order promptly.

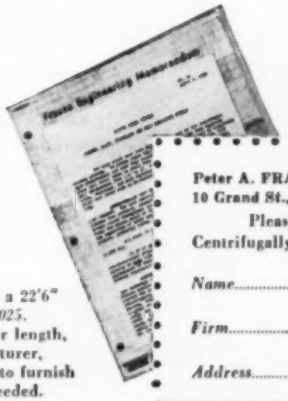
Government, ASTM, AMS, ABS, ACI and AISI specifications can be readily met. ACIPCO tubing is made in any standard or non-standard analysis. Steel used in its manufacture is produced in electric furnaces.



Fabrication of this hydraulic baling press required a 22'6" ram of AISI *1030*, and a 21'6" cylinder of AISI *1025*. ACIPCO tubing, circumferentially welded to proper length, was used successfully for both items. The manufacturer, Consolidated Baling Machine Co., relied on Frasse to furnish ACIPCO tubing in the size, length and analysis needed.

Typical applications for ACIPCO tubing include: Hydraulic cylinders, ship propulsion shafts, cracking still tubes, retorts, and paper mill rolls. In addition, it has received wide recognition as a component in weldment applications. Why not investigate the many advantages offered by this versatile product?

Frasse Engineering Memorandum #11 covers in detail the characteristics, properties, analyses and pertinent facts about ACIPCO centrifugally cast steel tubing. Mail the coupon below for your free copy today.



COMPLETE FACTS ABOUT ACIPCO CENTRIFUGALLY CAST TUBING

MAIL TODAY!

Peter A. FRASSE and Co., Inc.
10 Grand St., New York 13, N. Y.

Please send me, without obligation, complete facts about ACIPCO Centrifugally Cast Steel Tubing.

Name.....*Title*.....

Firm.....

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Call FRASSE 1st for **SEAMLESS, WELDED AND CENTRIFUGALLY CAST STEEL TUBING**

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...use.

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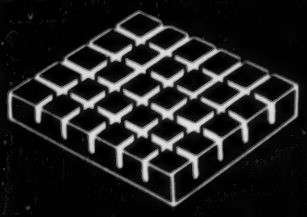
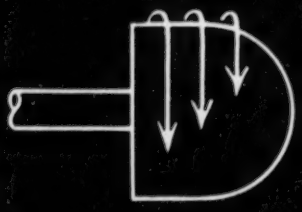


2. SAFE



3. ACCURATE

4. DURABLE

You get...

UNIFORM

SAFE

PRECISE

PRODUCTION

1. Made from solid blocks of perfectly mixed materials.
Result: Complete elimination of "hard and soft" spots.

2. Deep-knurled, high strength alloy steel spindles, and special adhesive.
Result: Abrasive heads stay on spindles.

3. Each wheel trued and shaped after mounting on its spindle.
Result: Perfectly concentric; ready to use when you get it.

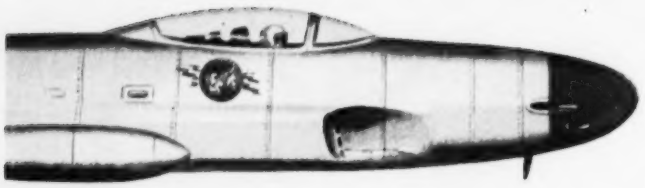
4. Completely uniform structure; pretested, positive bonding.
Result: Longer useful life; use them right down to the spindle.

BAY STATE

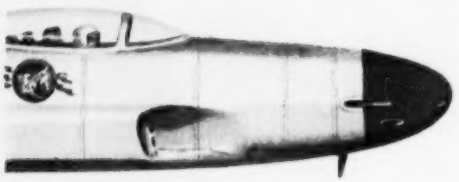
...CO.

INDICATOR ACCURACY
Precision Shaped
on the spindle for perfect contour and complete concentricity.
Deep-knurling
for EXTRA SAFETY, in high-strength alloy steel.
THE HEADS STAY ON!
BAY STATE
USE THEM . . .
Right down to the spindle!
Specially Bonded
Wrench-and-vise test proves its strength. This bond HOLDS, under EXTREME STRAIN.
BAY STATE

Jet plane



precision standards



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Bower precision is available for your industrial machine replacement needs

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FEDERAL-MOGUL SERVICE

(Division of Federal-Mogul Corporation)

DETROIT 13, MICHIGAN

Our 75 branches, in all principal cities, provide your bearing specialist with Federal-Mogul service on Bower bearings.

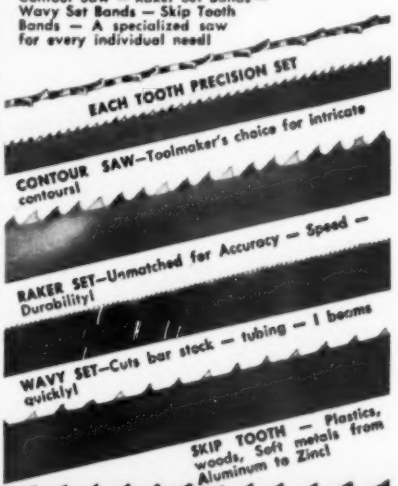
"EXTRAS"

Pay off in PRODUCTION and LONGER BLADE LIFE!

Here each roll of Atlantic raw band saw stock is subjected to initial quality control tests. After manufacture, each Atlantic Band Saw Tooth is precision gauged — your assurance of a perfect, standard set through every inch of saw stock. Atlantic saws *stay* accurate, too! Individually milled and heat hardened teeth retain their original set in daily use — cut true clean through — and leave score-free, mar-free finishes. From gang cutting to intricate contours, look to Atlantic Band Saws to do your every cutting job *better!*

SEND FOR LITERATURE ON THE ATLANTIC QUALITY BAND SAW LINE - TODAY!

Contour Saw — Raker Set Bands — Wavy Set Bands — Skip Tooth Bands — A specialized saw for every individual need!


EACH TOOTH PRECISION SET
CONTOUR SAW—Toolmaker's choice for intricate contours!
RAKER SET—Unmatched for Accuracy — Speed — Durability!
WAVY SET—Cuts bar stock — tubing — I beams quickly!
SKIP TOOTH — Plastics, woods, Soft metals from Aluminum to Zinc!

Atlantic

ATLANTIC SAW MFG. COMPANY, Inc.

BREWERY STREET

NOW-

A Long-Sought Production Aid from Industry's Most Complete Line of Filtration Equipment

HOFFMAN Vacu-matic FILTER

Two Sizes: 20 and 40 g.p.m.

Easily Installed on Present Machines

Write for New Bulletin A-915

for automatic continuous filtering of water soluble coolants from grinders, hones & other machine tools

Once again Hoffman meets your particular filtration problem with equipment specifically designed for the job! The "Vacu-matic," a continuous suction, endless belt filter, serves machines with clean coolant *automatically*. Uses vacuum (not gravity) for high flow rates. Coolant is drawn through filter belt into clean coolant chamber for recirculation to the machine. Solid particles are left on moving belt which drops them as dry sludge into tote box for easy removal.

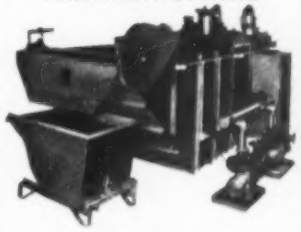
That's not all! Because air flows constantly through the "Vacu-matic" filter belt, coolant is kept cool, at or below room temperatures. The bacteria usually present in dirty coolant are reduced. The "Vacu-matic" is complete, compact, ready for hook-up on present machines in the same floor space now required by sump tanks.

Like all Hoffman specialized filtration equipment, the "Vacu-matic" is designed to pay for itself by reducing down time, extending tool life, and protecting quality control. A nation-wide staff of Hoffman filtration specialists is ready with facts and recommendations for your plant. Write now for free technical bulletins and the name of your nearest Hoffman representative.

For Groups of Machines

HOFFMAN

FLOTATION SYSTEMS

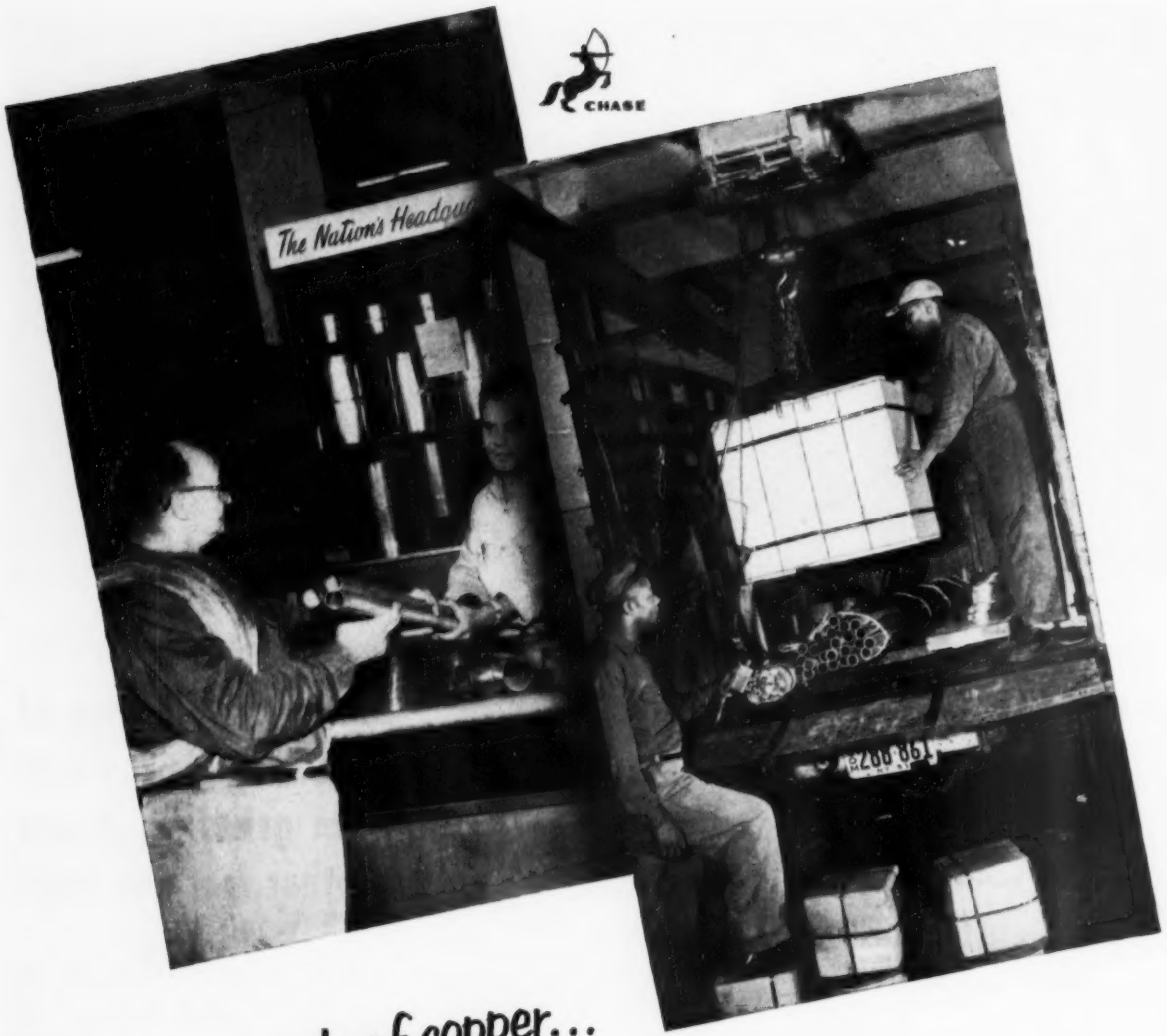


Fully Automatic Clarification with 20 to 1,800 g.p.m. capacities. Larger sizes to your specifications.
Write for Bulletin A-690.

Hoffman INDUSTRIAL FILTRATION DIVISION

INDUSTRIAL FILTRATION EQUIPMENT & ENGINEERING

H. S. HOFFMAN MACHINERY CORP., 241 LAMSON STREET, SYRACUSE 6, N. Y.



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Need just a few lengths of seamless brass tube? We'll be glad to hand them to you "over the counter." Or if your job calls for large quantities of brass or copper sheet, rod, wire or tube, we can speed it on its way to you. That's the kind of service you can get by calling your nearest Chase warehouse.

We can supply you, subject to government controls, with hundreds of items for production, maintenance or repair. That's why it pays to "try Chase first" for anything in brass or copper.

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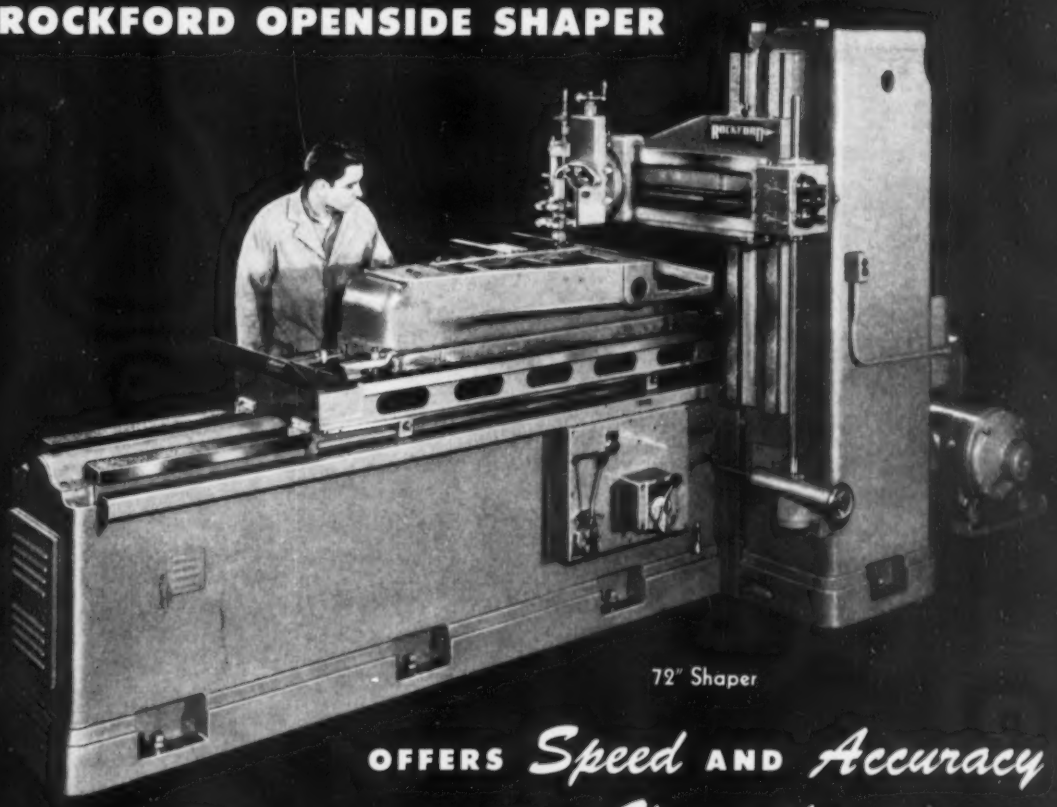
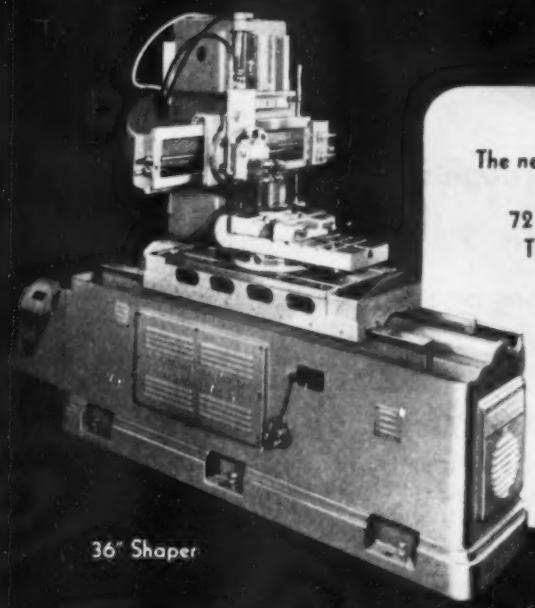
NEW . . . . .

ROCKFORD OPENSIDE SHAPER



72" Shaper

OFFERS *Speed* AND *Accuracy* PLUS *Versatility*



36" Shaper

The new 72" Rockford Openside Shaper gives you *best* results on *all* shaper jobs — with stroke lengths up to 72 inches.

This "big brother" of the Rockford Openside Shaper family (36", 48", 60", 72") has all the superior features of companion models, *plus* increased capacity. It's the maximum in versatility — large-job capacity with no sacrifice in speed or accuracy. And It's *Hydraulic* . . . of course.

Before you invest, investigate the new 72" Rockford Openside.

Hy-Draulic

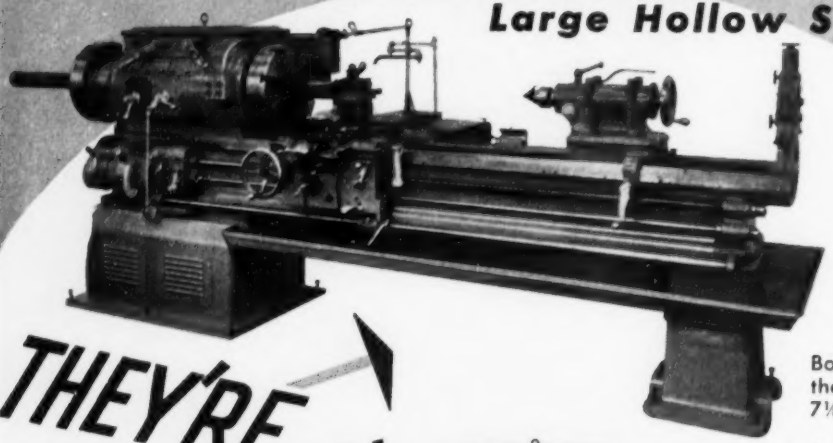
ROCKFORD MACHINE TOOL CO.

2500 Kishwaukee Street • Rockford, Illinois

FOR FASTER PRODUCTION, BETTER WORK, LOWER COSTS—

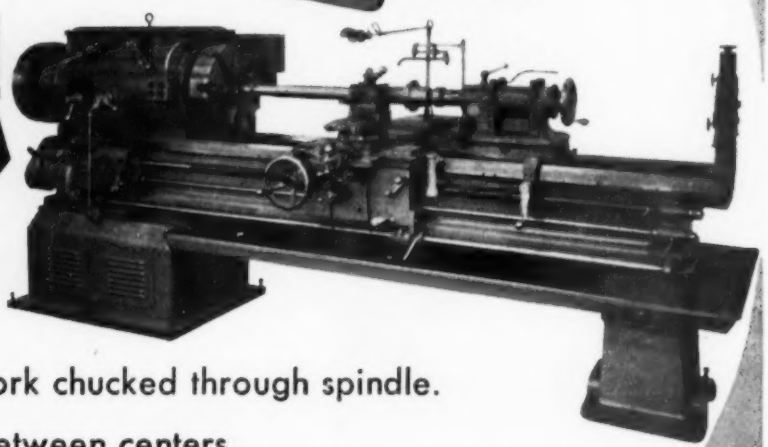
HYDRATROL LATHES

Large Hollow Spindle Type



Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

THEY'RE VERSATILE!



- Machine long work chucked through spindle.
- Machine work between centers.
- Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")

IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

LEHMANN MACHINE COMPANY

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Tool steel is our baby. It has been for 52 years. It always will be. That's why tool steel users look with confidence to Crucible.

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SPECIFY YOUR TOOL STEELS BY THESE BRAND NAMES

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CRUCIBLE first name in special purpose steels

52 years of Fine steelmaking **TOOL STEELS**

QUICKER DELIVERY
Our vastly increased production facilities mean quickest deliveries in the industry.

HIGHEST QUALITY
Constant research and improvement make these wheels the world's finest.

at competitive prices

Quality controlled
RESINOID BONDED WHEELS
for continuous fine performance

. . . rapid stock removal . . . no carbide ruined by heat checks . . . perfect "spark-out" on large diameter cutters . . . keen cutting edges . . . maximum economy in terms of carbide removed per dollar of wheel cost.

Continuous research and improved manufacturing methods have resulted in the finest Diamond Wheels for production maintenance of all carbide cutting tools, milling cutters, dies, etc.

Model CH-105 Carbide Tool Grinder gives the low tool maintenance cost small shops demand and large plants need. Equipped for wet grinding. 9000 RPM spindle gives higher surface speed to smaller, less expensive wheels making them cut much faster and perform more efficiently.

UNITED STATES DIAMOND WHEEL COMPANY
AURORA, ILLINOIS

"American made for American industry"

From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

WHEN you walk the tight-rope between close tolerances, or between good and bad finish, balance is vital. Be sure you have it, in machine-tool spindle or shaft, in tooling, in fixture. It will pay out in longer tool life and reduced scrap.

COLD-ROLL-FORMING
gives you all of these advantages
At lower Cost—

● In busy metal working plants, vigilant production men are constantly on the lookout for places where, due to increased demand for their products, the time is ripe for a change of methods. They know that in the shaping of metals into finished products or components, cold roll forming has many important quality and cost advantages over all other methods.

In some instances it becomes possible, by redesign of the product, to adopt cold roll forming. In others, the mere need for higher production makes the change profitable. Again, redesign often leads to a saving in weight which, in the case of the more expensive metals, alone may amount to much more than the conversion cost.

When such changes are indicated, feel free to avail yourself of the Yoder engineering service in analyzing and determining the practicability of cold roll forming, choice and cost of equipment, and other pertinent questions.

THE YODER COMPANY
5519 Walworth Ave., Cleveland 2, Ohio

Cold-Roll FORMING MACHINES
ENGINEERING YODER MANUFACTURING

What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit

Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

VEELOS DATA BOOK

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

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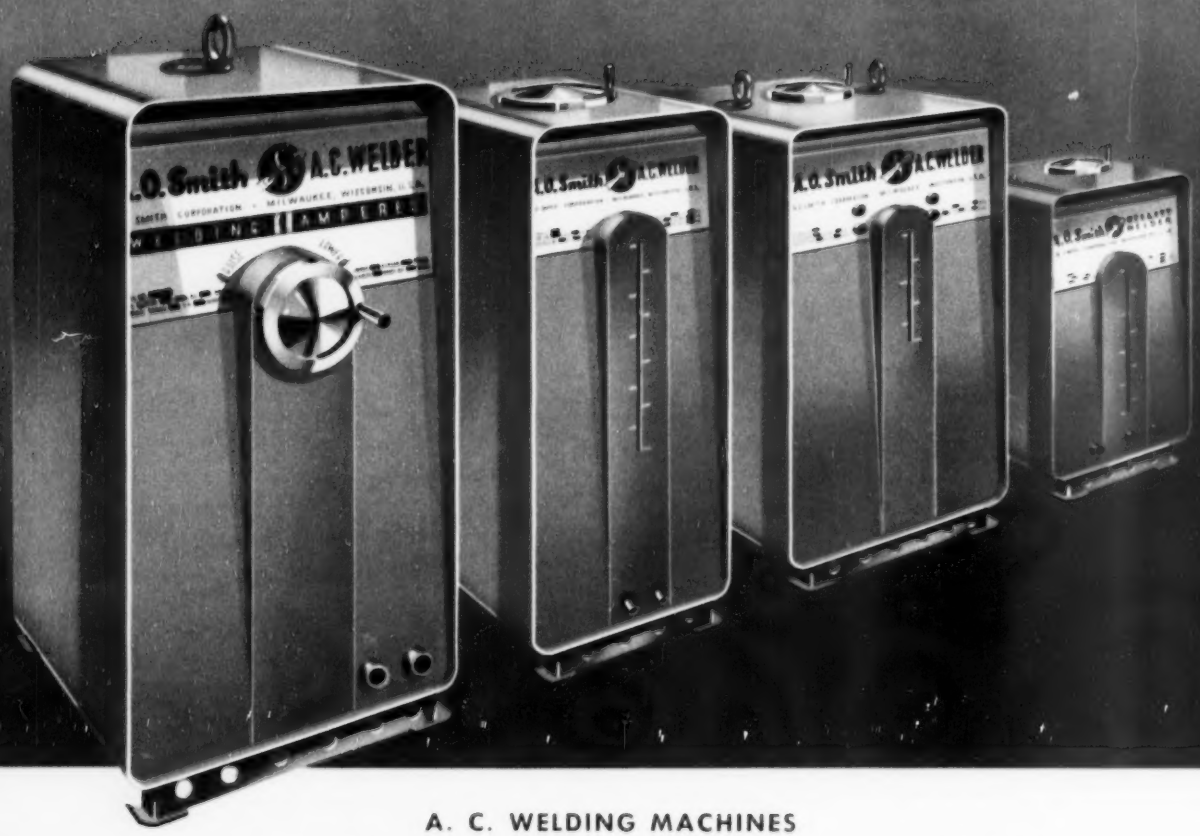
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

new era in welding!



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Heavy-Duty CHAMPION

300-, 400- and 500-Amp. Production Welding Models. The extra years of service built into these machines make these models real welding champions.

The CHALLENGER

200-, 300- and 400-Amp. Production Welding Models featuring wide amperage range for adaptability to more jobs in any production welding shop.

The AUTO-MAN

650-Amp. Model. For Automatic or Manual Operation, singly or in multiple set-ups. Offers unusual flexibility for your welding requirements.

The UTILITY

An all-purpose Utility welder with 25 to 180 Amp. range for repair-shop, maintenance and farm use, and featuring production welder construction.

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Production proved by one of the world's largest users of welding products

Now A. O. Smith advanced design... new plus features...give you the latest in welding machine efficiency

D. C. WELDING MACHINES

The D. C. RECTIFIER

200-, 300-, and 400-Amp. heavy-duty Production Welding Models for all d.c. jobs. The *one* rectifier-type welder designed to eliminate stack failure!

The FIELD KING Gasoline-Engine

200- and 300-Amp. Models. The most advanced of all engine-driven welding machines! Built for rugged jobs in the field. Welds with new speed and ease.

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WELDING PRODUCTS

Redesigned to match *today's* welding requirements, *A. O. Smith advanced design welders* offer you the advantages of improved construction, top welding performance, and more operating benefits. A. O. Smith welders put you in the best position to cope with today's requirements and costs. Whether your welding is manual or automatic, A. C. or D. C., A. O. Smith welders assure you of having the finest power source available anywhere.

Ask your A. O. Smith representative, your A. O. Smith distributor or write us, for full details about these advanced design welding machines. *They merit your study.* A. O. Smith Corporation, P. O. Box 584, Milwaukee 1, Wisconsin.

No. 117 of a Series of Typical Installations

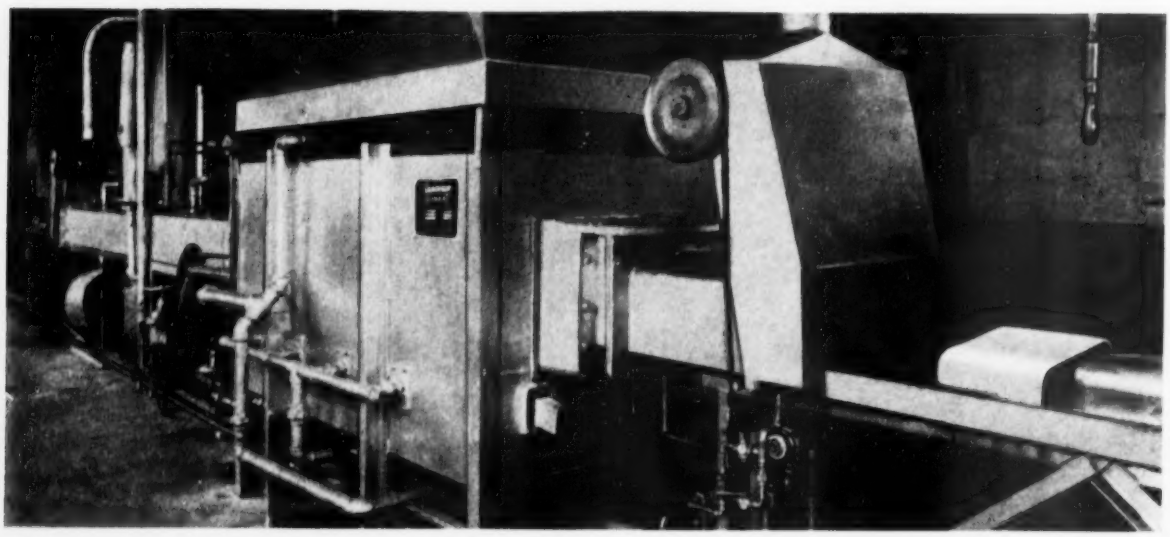
Sunbeam STEWART

THE BEST INDUSTRIAL FURNACES MADE

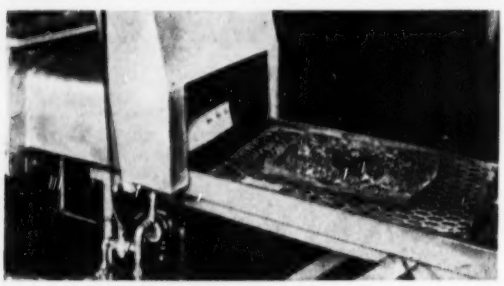
HOW SUNBEAM INDUSTRIAL FURNACES MEET THE DEMANDS ON THE PRODUCTION FRONT

CLEAN ANNEALING COMPTOMETER CASES AND MISCELLANEOUS SMALL PARTS

AT FELT & TARRANT, Chicago, Illinois



Mechanical calculating machines require precision manufacture and exacting heat treatment because of the wide variety of intricate stampings and cold drawn parts that are employed. Annealing at Felt & Tarrant is done in a Sunbeam Stewart atmosphere-control, gas-fired, pusher-type furnace. *The full muffle atmosphere control has been in continuous use since 1940,* with the exception of the periods of steel shortages, when alternate methods had to be substituted. Operating within the normal annealing and stress relieving temperatures, the original 35% nickel—18% chrome alloy muffle is still in operating condition and is in use at this time. To obtain this exceptional good life, the furnace design required a maximum in heat distribution and combustion characteristics to prevent any possibility of heat concentration and hot spots. This unit is sufficiently flexible to anneal the various size deep drawn steel cases as well as the more intricate smaller parts.



For smaller parts, a secondary fine meshed basket is used to convey the work. Heating chamber dimensions are: 6′ long x 20″ wide x 10″ high.

IF YOU ARE CONSIDERING DEFENSE WORK CALL SUNBEAM. Designs are available for heat treating the following materiel:

SHELLS: 57MM; 75MM; 90MM; 105MM; 120MM; 155MM; 3″, 5″, 6″, 8″ Navy Shells (Harden, Quench and Draw).

FORGINGS: Rotary Hearth and Pusher-type Forging Furnaces.

ARMOR PIERCING SHOT (Harden, Quench and Draw).

CARTRIDGE CASES (Anneal, Stress Relieve).

MACHINE GUN CLIPS (Harden, Quench and Draw).

JET AIRCRAFT and TANK PARTS

Sunbeam STEWART **INDUSTRIAL FURNACE DIVISION of Sunbeam CORPORATION**

(Formerly CHICAGO FLEXIBLE SHAFT CO.)

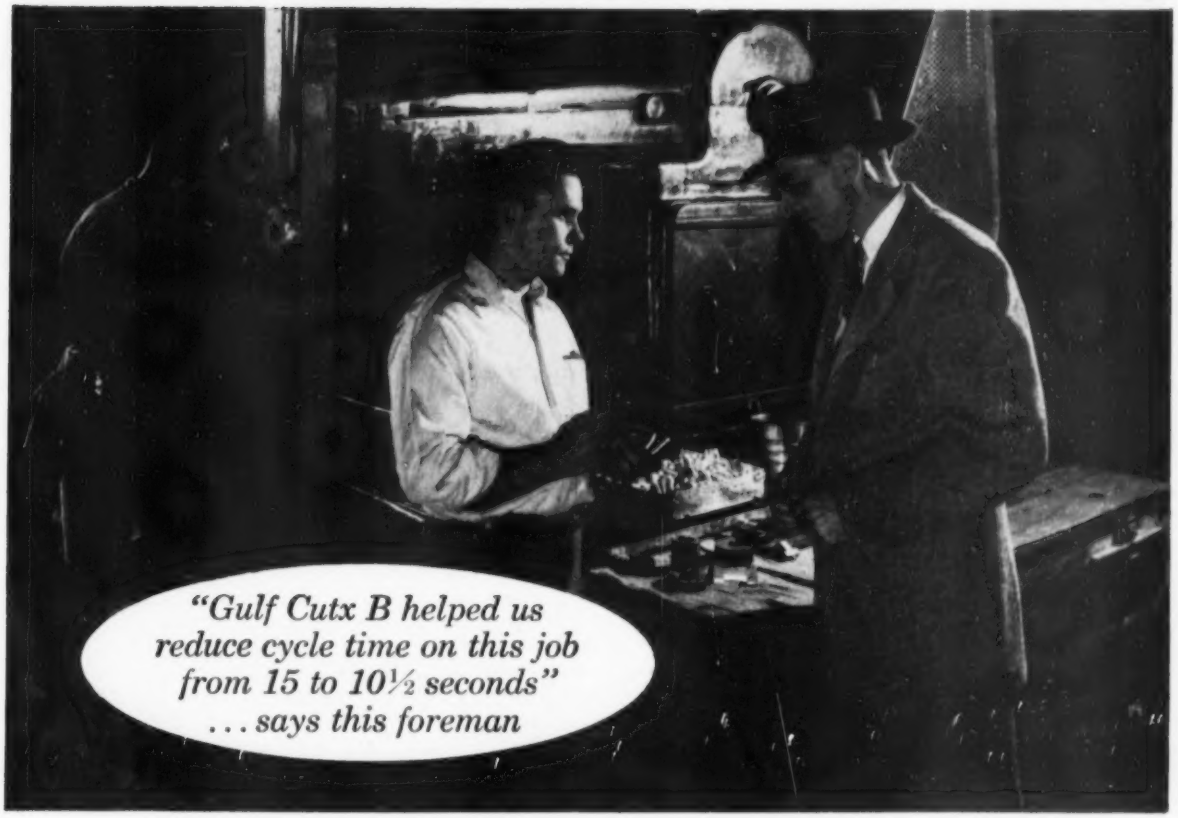
Main Office: Dept. 119, 4433 W. Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., New York 19—*Detroit Office:* 3049 E. Grand Blvd., Detroit

Canada Factory: 321 Weston Rd., So., Toronto 9

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM industrial furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM engineer will be glad to call and discuss your heat treating problems with you.

fuses finished faster

with GULF CUTX B



Material—17 ST Aluminum Alloy; Operation—Turn, face, bore, and thread projectile fuse; Machine—6 spindle Conamatic; Cutting Oil—Gulf Cutx B, which proved superior to 4 other cutting oils by actual comparative tests; other benefits with Gulf Cutx B—better threads and longer tool life.

Another example of improved machining practice with Gulf Quality Cutting Oils! Call in a Gulf Sales Engineer today and let him help you find opportunities for greater production at lower cost through the use of the right Gulf cutting oil for the job. Write, wire, or phone your nearest Gulf office.

GULF OIL CORPORATION
GULF REFINING COMPANY
PITTSBURGH 30, PENNSYLVANIA

GULF SERVES INDUSTRY

Baker single purpose type drills are heavy duty . . . provide a wide range of speeds and feeds secured by pick-off gears. Models illustrated can be delivered within a short period from receipt of order for Single and Multiple Spindle Drilling . . . Reaming . . . Boring . . . Facing . . . Chamfering . . . Undercutting and Tapping Operations. Write for full details.

MAJOR SPECIFICATIONS—Single Purpose Types

	217	321	422
1. Capacity—Max. Dia. Drill in S.A.E. 1035 Steel	2	3	4-1/2
2. Max. H. P. Motor used	10	15	20
3. Distance center of Spindle to Frame (Gap)*	12-1/4"	12-1/4"	12-1/4"
4. Maximum Spindle Travel	12"	16"	16"
5. Spindle—Outside Dia. splined driving end	2"	2-13/16"	3-1/4"
6. Dia. of Spindle Sleeve	3-1/4"	4-1/4"	5-1/4"
7. Dia. of Spindle Nose	3.225	4.225	5.225
8. Morse Taper in Spindle as standard	No. 5	No. 5	No. 6
9. Standard Speed Range in R.P.M.	76-614	27-220	20-165

*Can be increased 3" by use of offset Spacer Block.

Baker Brothers, Inc.
Toledo, Ohio

Gentlemen:

Please send more information on Baker Standard Drills to:

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BAKER BROTHERS, INC. Toledo, Ohio

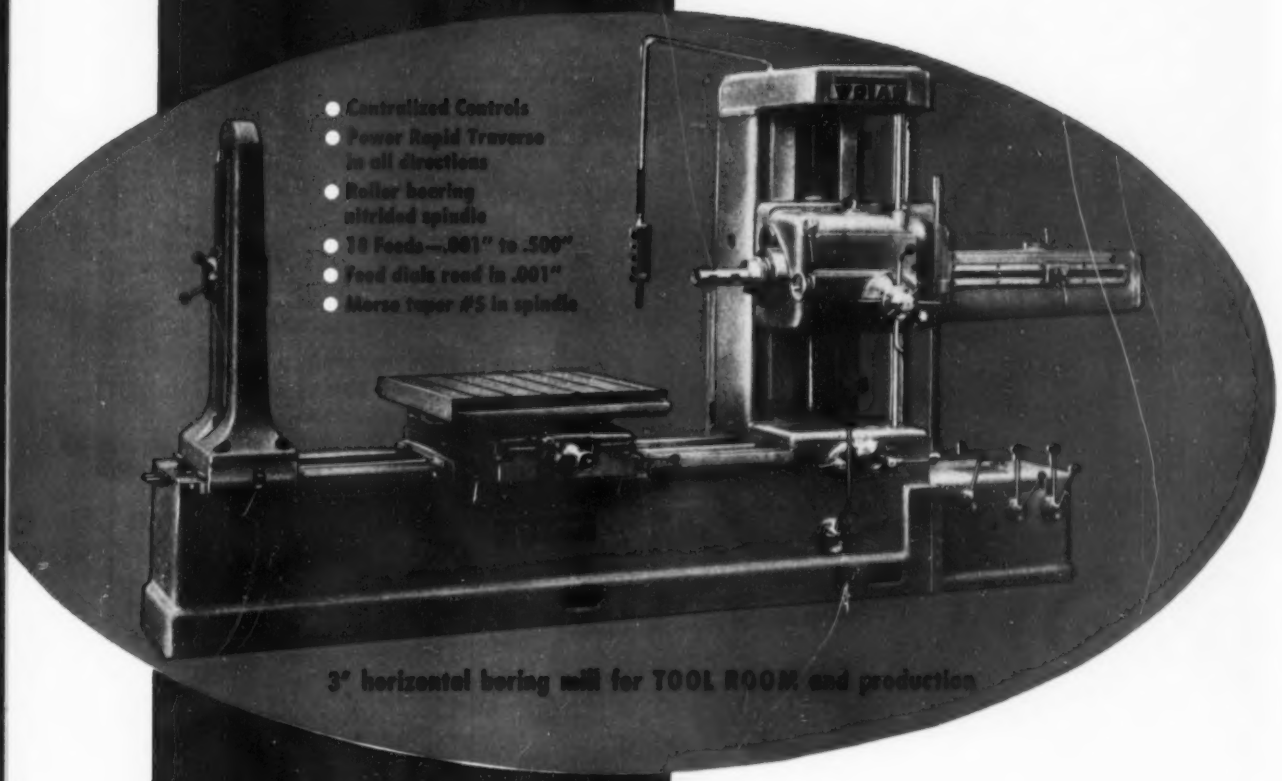
DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

immediate delivery

3" horizontal boring mill for TOOL ROOM and production

table top swivels full 360°

18 speeds—17 to 910 r.p.m.


Centralized Controls
Power Rapid Traverse in all directions
Roller bearing nitrided spindle
18 Feeds—.001" to .500"
Feed dials read in .001"
Morse taper #5 in spindle
3" horizontal boring mill for TOOL ROOM and production

WOTAN

over 75 years of "know-how" in the manufacture of precision production machinery

Users of the WOTAN Boring Mill find that advanced engineering and expert craftsmanship have combined to produce an outstanding piece of tool room equipment that is also well suited to long and short production runs.

Simplicity of design permits an unusually low price. Parker Machine Company has these Mills on hand for immediate delivery. Write or phone John Schleiffer at our Brooklyn headquarters for full information.

Parker Machine Company, Inc.

158 PIONEER ST., BROOKLYN 31, NEW YORK • TRIANGLE 5-2103 and 2157

BORING MILL

GEAR HOBBER

INTERNAL GRINDER

16 INCH SHAPER

22 INCH SHAPER

Teeth for the Giant

job-engineered...and on time

The tremendous power of America's metalworking giants is often focused at the simple tip of a cutting tool. *ADAMAS tungsten carbide* tool tips are the foundation for many of today's best production records. High-quality ADAMAS carbide grades are job-engineered to fit both standard and special tool tip, die and wear part applications. Delivery is *fastest in the industry.*

Write for your ADAMAS catalog today . . .

ADAMAS

TUNGSTEN CARBIDE®

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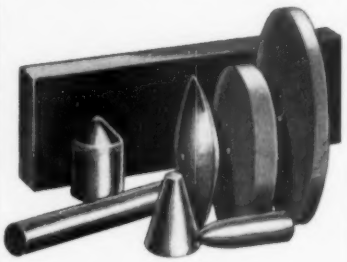
Simplify Your
BURRING, SMOOTHING
and **POLISHING** operations
CRATEX
RUBBERIZED ABRASIVES

"cushioned action performance"



Today's changing manufacturing picture — new production methods, new metals, increased use of plastics, new finishes, the rise in labor and material costs — all of these factors deserve the consideration and use of Cratex Rubberized abrasives for:

BURRING • SMOOTHING • POLISHING
Cleaning, Blending, Lapping, Finishing and Trimming Operations

CRATEX Rubberized Abrasives are made in four "grit-types" from coarse to extra fine —and over 160 standard sizes in—

WHEELS • POINTS • BLOCKS
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Ideal for Machine or Manual application on hard or soft **Metals, Plastics, Glass** and scores of other materials.

Backed by 30 years of industrial, professional and technical application-performance, CRATEX Rubberized Abrasives have achieved an unduplicated reputation for lowering "unit costs" with unparalleled results in burring, smoothing and polishing operations. Investigate Cratex Rubberized Abrasives . . . "The World's Finest For Industrial Use" . . . send today for Descriptive Catalog which gives full details, applications and prices.

CRATEX FREE TECHNICAL SERVICE

Cratex abrasive engineers will gladly, without charge, analyze your individual production operations and recommend the correct "rubberized abrasives" to lower your production costs and to meet your burring, smoothing and polishing problems. Check the coupon for—"Application Analysis Form."

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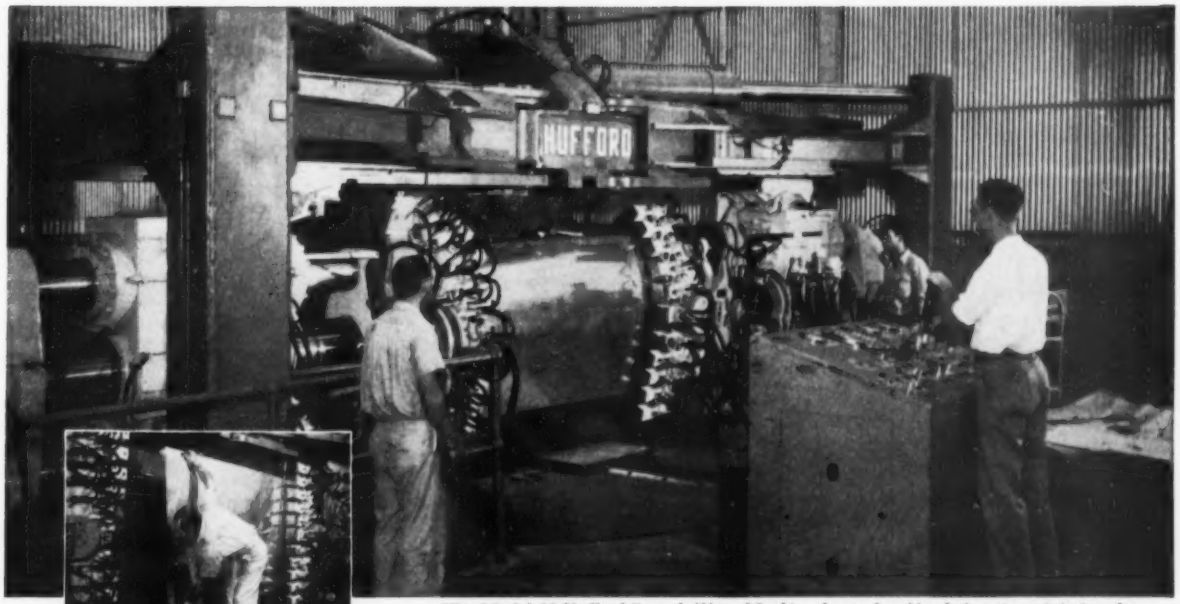
Newest NEWS in Aircraft Manufacture

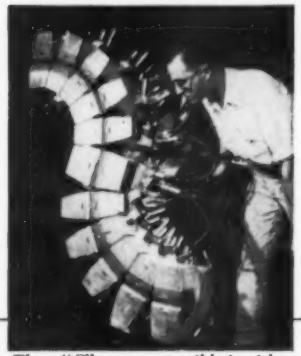
the Hufford HYDRA-CURVE sheet jaws



This Model 46 Hufford Stretch-Wrap Machine, located at North American Aviation, Inc., Inglewood, California, shows the new Hufford Hydra-Curve Jaws pre-shaping the sheet to match the vertical die contour. The arms wrap back to produce finished parts.

Jaws assume a straight vertical line for easy loading. Jaw positions, straight or curved, are made from the operator's control pedestal.

Note the extreme curvature possible with the new Hufford Jaws.



These "S" curves, possible in either direction, show the flexibility of the Hufford Hydra-Curve Jaws.

All photos courtesy North American Aviation, Inc.

They ease forming problems, cut material costs, reduce sheet losses through breakage.

Here's the newest step in aircraft manufacture—another "FIRST" for Hufford, *pioneers and developers of the famous stretch-wrap forming process!*

THE NEW HUFFORD HYDRA-CURVE JAWS ease the forming of metal skins which are an important structural part of each plane. Used on the huge Hufford stretch-wrap forming machines, these new jaws are loaded in a straight, upright position—*but look what happens when the jaws begin to function!*

Out of the many possible curvatures the jaws can assume, sheets are easily pre-curved to match the cross sectional contours of the die. Stretching and wrapping around the die then completes the forming of the finished part.

ADVANTAGES? Yes . . . *Big* savings in material costs; better, faster forming; lower transitional area stresses and a minimum of losses resulting from sheet breakage!

These new curvable jaws again prove that *Stretch-Wrap Forming at its best comes FIRST from Hufford!*

HUFFORD
Machine Works Inc.
EL SEGUNDO, CALIFORNIA

Manufacturers of

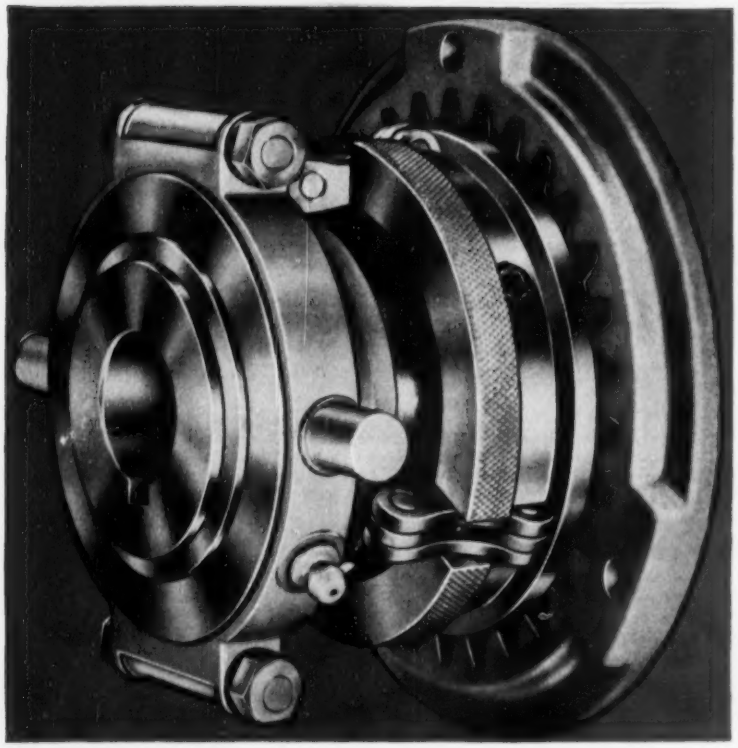
ANNOUNCING.....

THE NEW LOW COST

single disc

JOHNSON CLUTCHES

an addition to the* MAXITORQ *line



The Johnson 350 and 450 Single Disc Clutches are the newest additions to the Carlyle Johnson line... fitting companions to the Maxitorq multi-disc series.

They are ideal for light machinery service to 6 H.P. Several driving combinations are available, including V-belt. Far greater capacity at low cost is provided. (See column at right for typical applications.) They have the same "floating disc" principle as the Maxitorq Clutch . . . discs that ride free in neutral . . . no drag, no abrasion, no heating. A simple hex-key frees the knurled ring for easy manual clutch adjustment. Machine designers will find the solution to many problems with this new Johnson Clutch.

Send for Bulletin
#250—AM-2

1CJ83

Frankly

SPEAKING

Because of a large backlog of orders, The Carlyle Johnson Machine Company found it necessary to postpone the announcement of the new Johnson Single Disc Clutches.

Now, with added equipment for high speed production, it is possible to produce and ship the new clutches without undue delay. In fact, small orders or units for try-out in new machines will be forwarded at once. Design features make the Johnson especially suitable for installation in the following machinery:

Accessory Drives, Air Compressors, Bag Making, Boat Drives, Bread Wrapping, Chain Drives, Combines (farm), Conveyors, Crop Seeders, Cultivators, Dusting Machines, Feed Grinders, Floor Scrubbing, Fruit Cleaners, Gasoline Engines, Generator Drives, Hay Balers, Hoists, Loaders, Lawn Mowers, Milk Coolers, Mixing Machines, Motor Scooters, Packaging Machines, Paper Shredders, Power Fans, Power Saws, Power Take-Offs, Pumping Equipment, Sand Spreaders, Sewing Machines, Sheep Shearers, Spraying Equipment, Textile Machinery, Threshers (small), Tobacco Machinery, Tool Grinders, Tractors (garden), "V" Belt Drives, Vegetable Sorters.

Naturally, these are but a few of the possible applications for the Johnson Single Disc Clutch. The field is wide open, with new machinery constantly being developed.

Included in the driving combinations are: Gear Tooth, Bolted Plate, Pulley Type, Hub Adapter, Cut-Off Coupling Adapter, Single V-Belt Pulley Drive, and Double V-Belt Pulley Drive.

Carlyle Johnson engineers offer their engineering assistance in cooperation with your engineers and machine designers to develop the correct solution of your power transmission requirements. Write to Frank R. Simon, The Carlyle Johnson Machine Co., Manchester, Conn.

The New – ARTHUR KLINK

HYDRAULIC

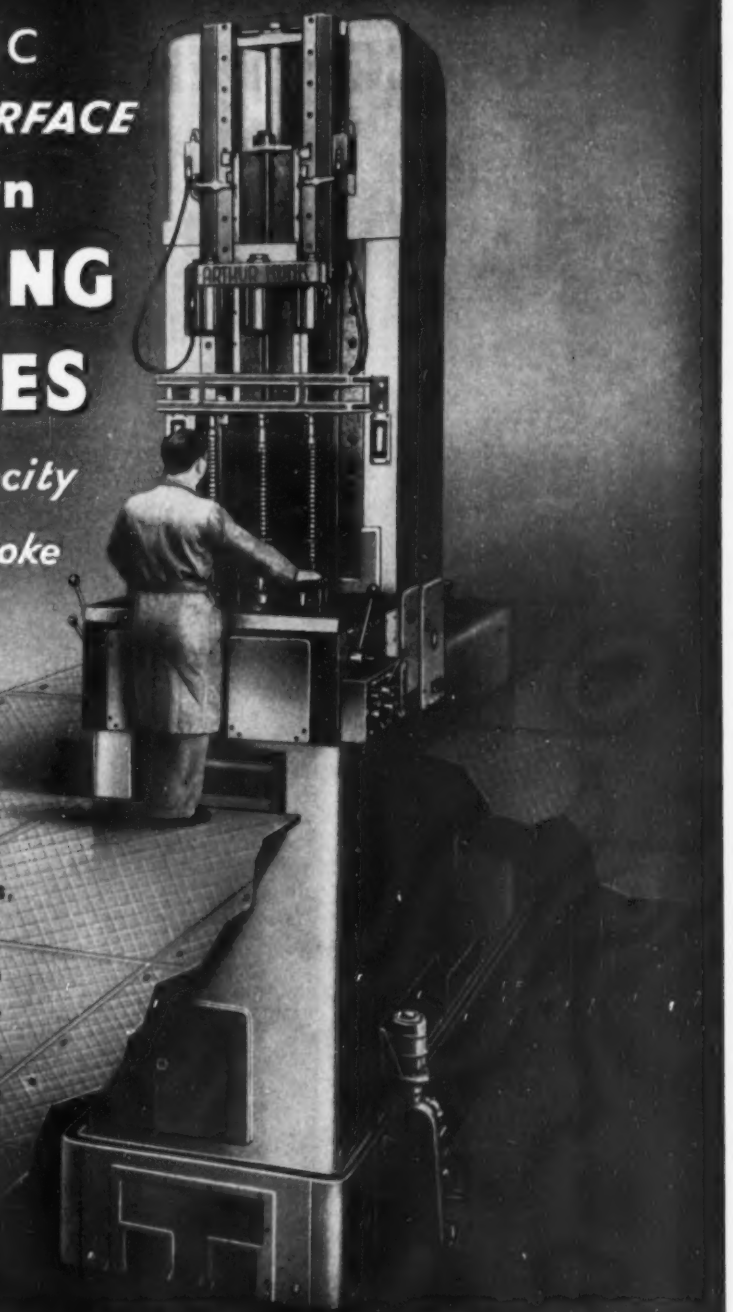
INTERNAL or SURFACE

Pull Down

BROACHING MACHINES

10 to 50 Ton Capacity

45 to 70 inch Stroke



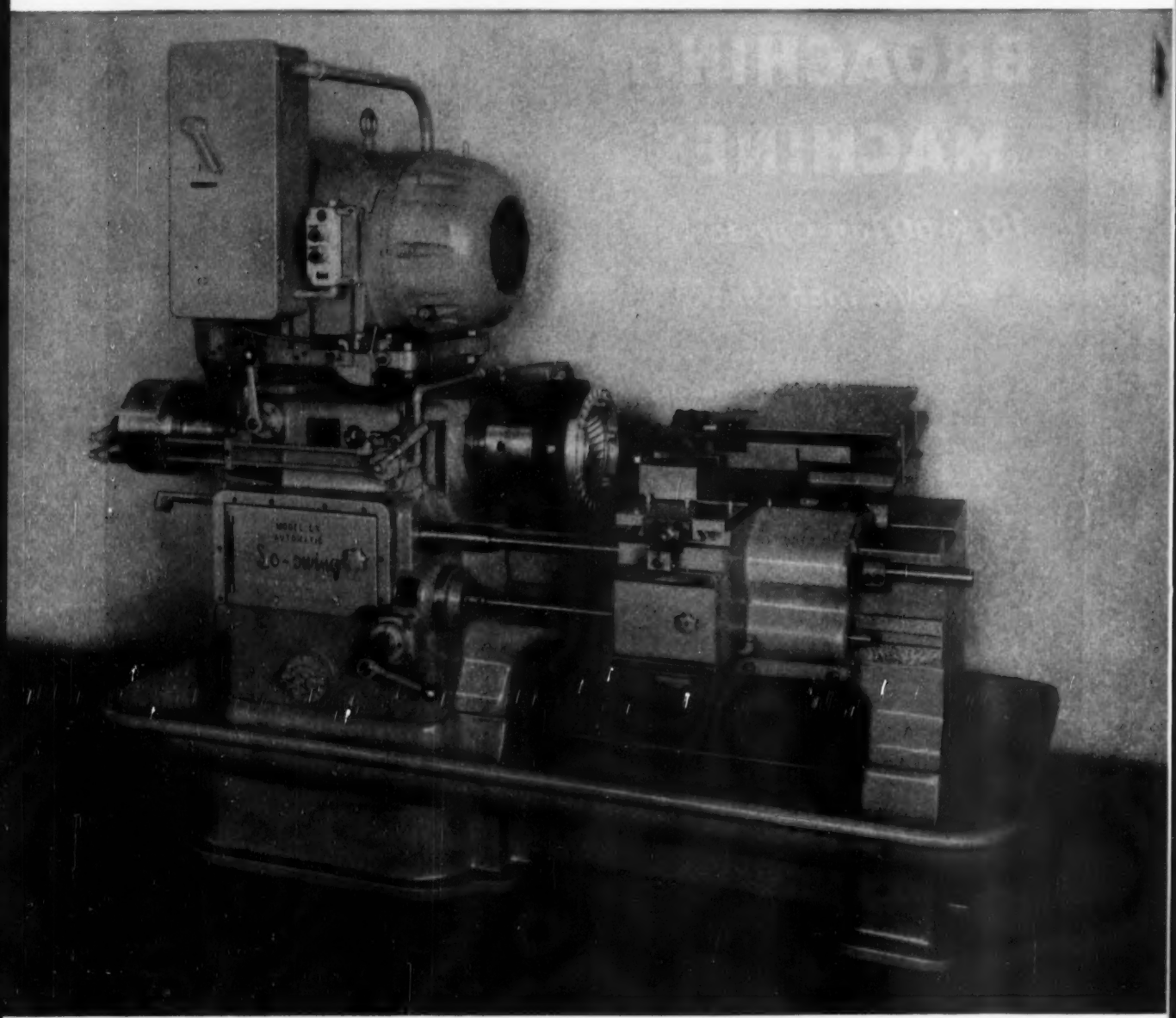
Photograph shows a 50 Ton Machine employed on rolled and welded 1/2 inch steel plate STARTER-DYNAMO HOUSINGS, 3-1/8" × 6" which are broached to finished size in one operation at the rate of 300 pieces per hour, using 3 broaches and removing 1/32" from the bore of each housing.

BROACHING MACHINES AND BROACHES

ARTHUR KLINK G.M.B.H. NIEFERN BADEN - GERMANY

MACHINE OF

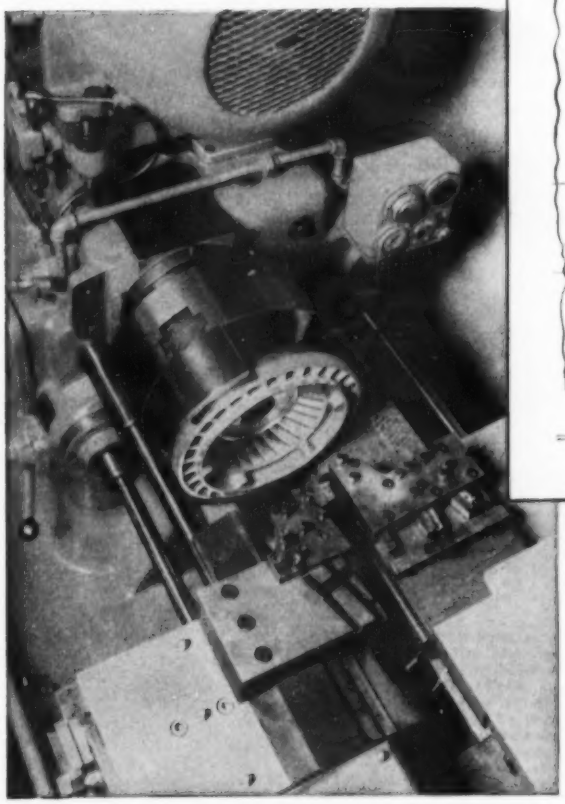
Lo-swing LATHE MACHINES
TORQUE CONVERTER COUPLING
AUTOMATICALLY

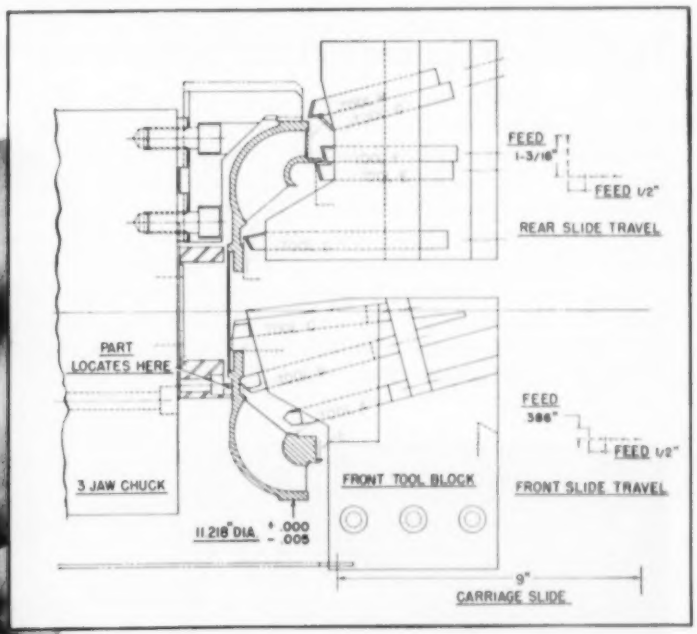


PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK





Problem: **To bore, turn and face several dimensions on aluminum torque converter couplings.**

Solution: **The Model LR Automatic Lo-swing Lathe was selected for this job and special tooling developed to enable all dimensions to be machined in one chucking. The work is held in an air-operated, three-jaw chuck fitted with mushroom type jaws to prevent distortion of the casting.**

Carbide cutting tools are mounted on the front and rear slides as illustrated. Both front and rear slides have cross and longitudinal movements permitting either boring or turning operations combined with facing operations. All tools cut simultaneously and the entire sequence of operations is automatic.

The line drawing shows the tooling layout and identifies the surfaces finished by each individual tool. A production of 60 pieces per hour at 80% efficiency is maintained.

Let Seneca Falls engineers assist in solving your automatic turning problems.

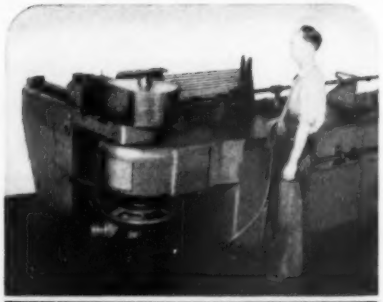
SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*

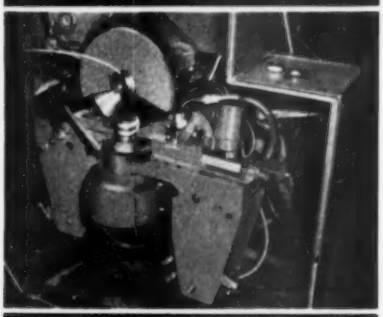
PRODUCTION Short-Cuts with PINES *Hydraulic* BENDING EQUIPMENT

Tooling Set-Ups Engineered To Meet Your Needs

Here are five examples of bending applications illustrating how Pines machines are successfully employed to save time and cut costs on a wide range of bending work. As shown, different tooling setups are engineered and easily applied to handle a variety of production requirements. Hydraulic power, which is used on all Pines Benders, assures accurate, uniform production results and safe, dependable performance. Push-button controls and automatic operation assure high efficiency and production economy. There's a complete range of Pines Benders designed to handle light or extra heavy work, small lot, or high production runs. Call on Pines engineers when you need help with a bending problem. There is no obligation. Phone Aurora 2-7608.

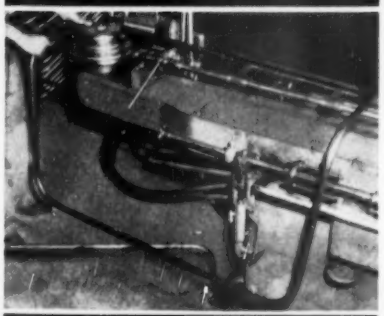


1. MULTIPLE GROOVE DIE — on Pines Size 3 Automatic Bending Machine forms ten 7/16" x 67-1/2" steel rods simultaneously to a 22" radius for farm implements.

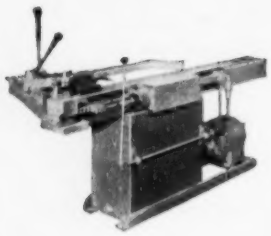


2. DOUBLE DIE AND CUT-OFF SETUP — on Pines Size 3/4 Automatic Bender. Produces 3/4" copper return bends to 7/8" c/l radii automatically, two pieces at a time.

4. FORMING BLOWER HOUSINGS ON PINES ROTARY BENDER — bends irregular curve (radii of 5-17/32" to 7-3/4") in 5-1/2" width stock at a speed of 89 pieces per hour. Floating bronze pad acts as a wiper shoe, maintains uniform pressure, assures smooth, wrinkle-free results.



3. TRIPLE RADIUS SETUP — on Pines Size 3/4 Automatic Bender handles three different radii and six 90-degree bends in 1-1/8" tubing in fast sequence. Increases truck seat frame output with less handling.



5. PINES SEMI-AUTOMATIC BENDER — tooled for production-line bending of extruded aluminum automotive moldings. Simple setups and easy manual toggle clamping also provides unusual economy for variable short-run and maintenance work not adaptable to fully automatic equipment. Hydraulic power assures uniform results, safe operation.

***Write* TODAY FOR FREE LITERATURE**

Write for free literature describing and illustrating various Pines Benders, attachments, and methods on actual jobs. Find out how Pines Benders are designed to save time and cut costs on a wide range of work.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

BENDING · DEBURRING · CHAMFERING · THREADING MACHINERY

672 WALNUT • AURORA, ILLINOIS

Get Help on *Any* **PROBLEM RELATED TO HONED SURFACES**

WITH **BARNESDRIL** COMPLETE HONING SERVICE

ENGINEERING • TOOLS • MACHINES • ABRASIVES

BARNESDRIL

HONING TOOLS

- Use a variety of abrasive stones.
- Available for new machines or machines in the field.
- Serviced by special abrasive experts.
- Replacement stones for all types.

BARNESDRIL

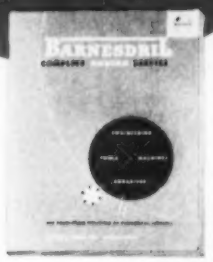
AUTOMATIC BORE-TO-BORE SIZING

BARNESDRIL tool design and development has produced Automatic Bore-To-Bore sizing. The most accurate sizing method yet introduced. The entire sizing operation is now simplified and divorced from the effects of eccentric or uneven stone wear.

BARNESDRIL

ENGINEERING AND MACHINES

BARNESDRIL Engineers have the distinction of first introducing the honing process as a mass production method with the first honing machine built in 1924. They have since developed honing techniques and equipment for both horizontal and vertical applications in finishing automotive and farm implement parts, hydraulic cylinders, gun barrels and recoil mechanisms. With this background of experience and development of a complete line of honing equipment **BARNESDRIL** Engineers assure you of consistent trouble free production in any phase of honing cylindrical surfaces.



Write for bulletin "Complete Honing Service" sent free upon receipt of letterhead request.

ENGINEERING • TOOLS • MACHINES • ABRASIVES

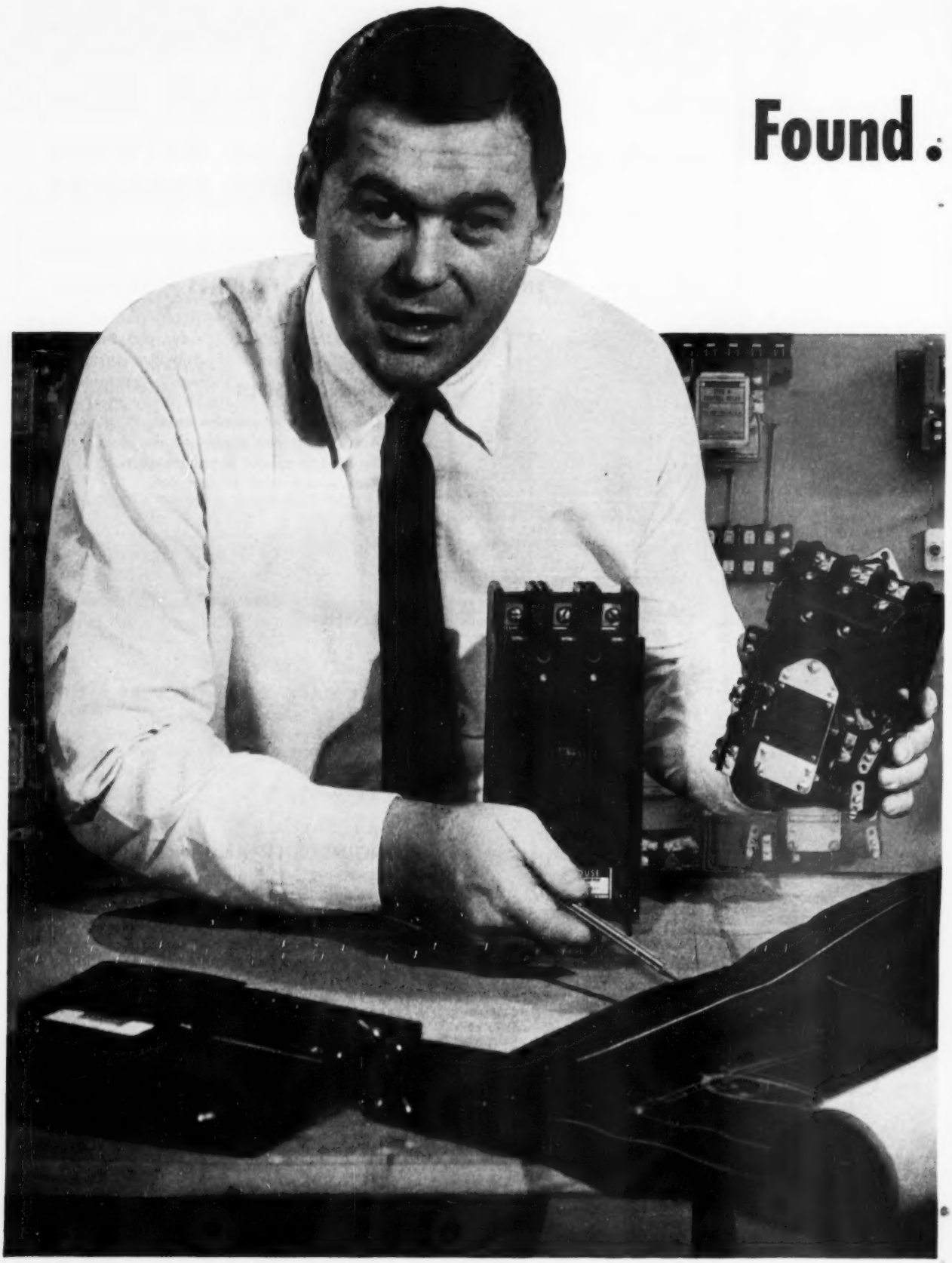
Get in Touch with Your **BARNESDRIL** Representative Today. Ask Him for a Proposal on Your Honing Requirements. Or Write

HOLE **BARNESDRIL** FINISHING

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Found.



..a new way to better machine control panels

Match proved protection of Westinghouse AB Circuit Breakers with the dependability of Westinghouse Motor Control

Why? Because Westinghouse Motor Control will give you top performance in your *entire* control panel—performance that you've always had with Westinghouse AB Circuit Breakers. With Westinghouse Control, you get the same dependability and versatility. You can build panels that do more work, faster, with greater accuracy, with less attention, with complete protection. Panels that will make your machine easier to sell.

Both Westinghouse Circuit Breakers and Control provide the greatest variety of functions in the fewest possible units. The result? Flexibility in use and arrangement of panel components, savings in space, speed in mounting parts.

Here are two of the exclusive advantages in Westinghouse Linestarters® that will give you maximum dependability for millions of cycles.

1. Knife-edge bearing on which is mounted Life-Line's only moving part. No sliding members to cause binding friction, mechanical wear, electrical failure.

2. Bimetallic disc-type principle of overload protection—snap-action protection that cannot fatigue, never fails. The Westinghouse Bi-metal Relay retains precise calibration because it is not affected by aging, oxidation or repeated resetting. Attempt all the "hot" resets you want—it won't fail.

Get full value—in designing, in buying, in mounting, get the advantages of both Westinghouse Circuit Breakers and Motor Control. Your Westinghouse Representative will be glad to assist in application problems, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-30163

YOU CAN BE **SURE**...IF IT'S

Westinghouse

Years of B&D development pay off for you in high-speed, high-precision grinding!

ALL-NEW! BLACK & DECKER No. 8 DIE GRINDER only $85.00

ALL-NEW POWER! Powerful Black & Decker motor—smallest in any B&D Tool—designed and built by the recognized world's leader in the field!

ALL-NEW SPEED! High no-load speed of 30,000 R.P.M. gives 9500 s.f.m. with 1¼" high-speed bonded wheel!

ALL-NEW COMPACTNESS! Overall length is only 11¾". Main housing diameter is only 2⅛" for convenient, accurate handling. And it weighs only 2⅛ lbs!

ALL-NEW HANDLING EASE! Extended spindle housing permits gripping tool close to the grinding stone for delicate, careful grinding!

ALL-NEW CHUCK DESIGN! Latest design collet chuck tightly grips mounted points and stones with ¼" shanks. Split sleeve (only $1.40 extra) permits reducing collet opening to take ⅛" shanks.

Packed with all-new features for all-new savings in time, labor, money!

NOW it can be told . . . a *completely new* Black & Decker No. 8 Die Grinder with *everything* you need for precision portable grinding . . . *everything* that years of engineering development can pack into it! It turns out high precision work at high speeds with exceptionally smooth power flow. It's easy to handle because of outstanding light weight, and compactness. It drives a wide variety of wheels, shaped stones and burrs . . . for grinding and burring operations on stamping, casting and forging dies . . . for grinding and burring in hard-to-reach spots on other parts!

Call your nearby Black & Decker Distributor for an eye-opening demonstration. Or write for detailed information on the No. 8 Die Grinder and free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. CO., 604 Pennsylvania Ave., Towson 4, Md.

B&D Black & Decker PORTABLE ELECTRIC TOOLS

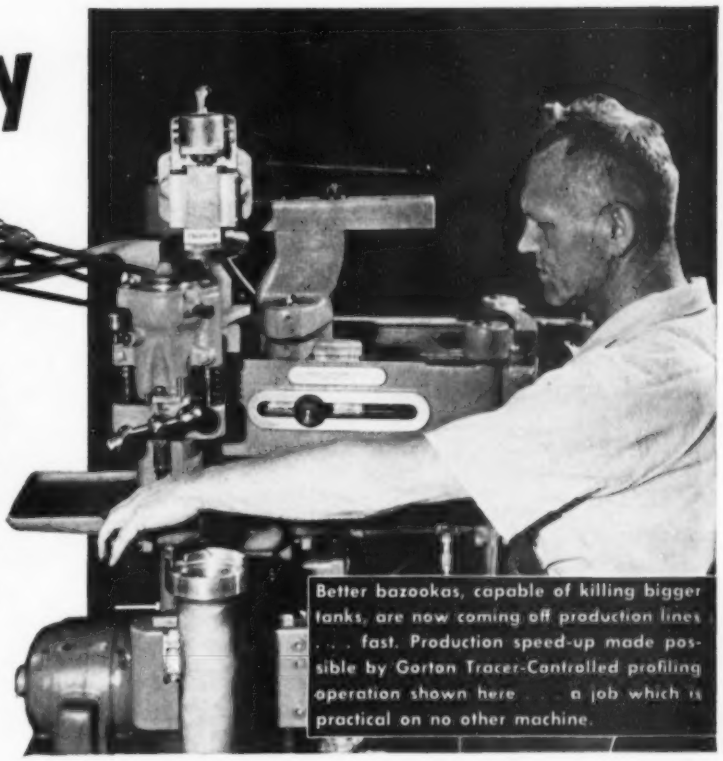
BLACK & DECKER 34 Factory Branches SERVICE

. . . use them to save time, trouble, money!

Pantography at Work!

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

- **IMPROVES QUALITY**
- **INCREASES PRODUCTION**
- **CUTS COSTS**

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 by 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka.

MATERIAL: Aluminum alloy.

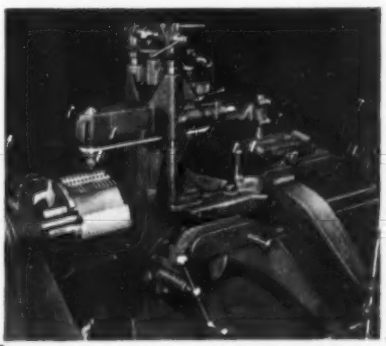
CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant.

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually.

HOLDING FIXTURE: Pneumatic-operated internal expanding type.

APPROX. TIME: 36 pieces per hour.

ALTERNATE METHODS: None practical.



THIS OPERATION SPEEDED UP 6 TIMES

Gorton Tracer Control chamfers ends of interrupted threads in breech ring and on breech block of 155 mm. gun. Previous time, 4 hours; Gorton time, 40 minutes.

GEORGE GORTON MACHINE CO.

1502 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655 .1502

Firm .....

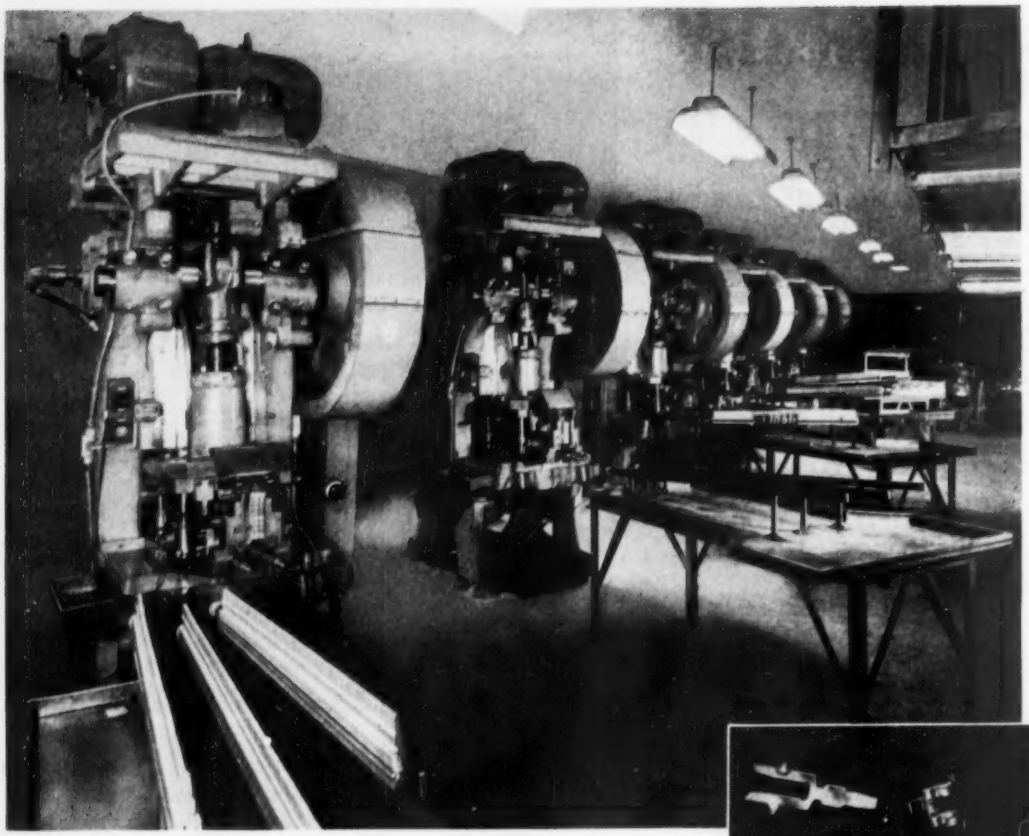
Name .....

Title .....

Address .....

City, State .....

P3554-R



The flat stamped parts are magazine fed to the Inclinables for the final operation in forming these cartridge clips.

L.A. Young Spring & Wire of Detroit depends on FERRACUTE INCLINABLES for high-speed production of cartridge clips

This battery of Ferracute CG 16½ Inclinable Presses is an important part of the high-production operations of the L.A. Young Spring and Wire Corporation in Detroit. These presses are of 88 tons capacity, operated by combination air friction clutches and driven by variable speed units. Ferracute Inclinables are available in a complete range of sizes from 6 to 200 tons. Your inquiries concerning specific applications are invited.

FERRACUTE
Since 1863

MACHINE COMPANY

Manufacturers of Power Presses and Special Machinery • BRIDGETON, NEW JERSEY, U.S.A.

When You Build a Pile Driver - You Need

DEPENDABILITY

THAT'S WHY McKIERNAN-TERRY SPECIFIES

MEEHANITE® CASTINGS

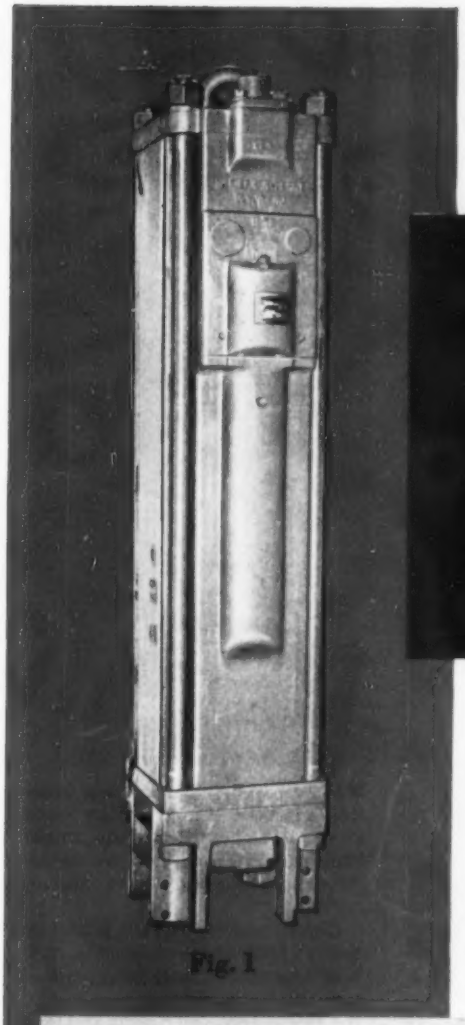


Fig. 1

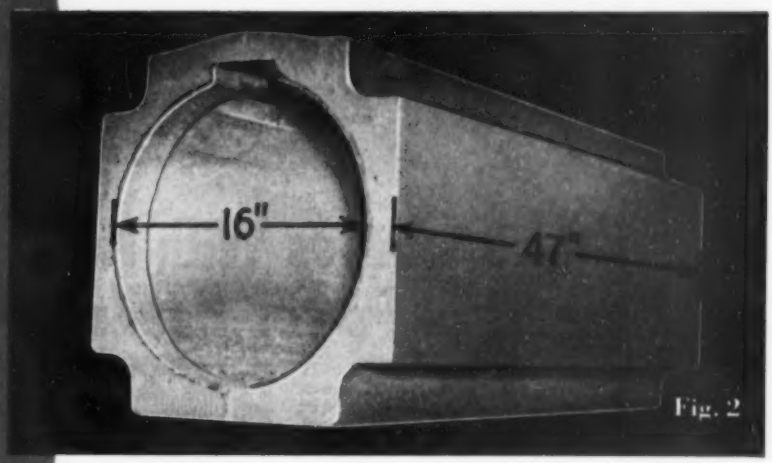


Fig. 2

In the pile driver illustrated (Fig. 1), built by McKiernan-Terry Corporation, Dover, New Jersey, the severe working conditions imposed upon such units require complete dependability in operation. The top and bottom (Fig. 2) cylinders are vital units in the functioning of the equipment and must be dense, pressure tight, strong and machinable. Both cylinders are Meehanite castings, each weighing about 2,000 pounds.

Meehanite castings regularly meet the rigid specifications for these components.

MEEHANITE FOUNDRIES

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
De Laval Steam Turbine Co.	Trenton, New Jersey
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
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Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Koehring Company	Milwaukee, Wis.
Lincoln Foundry Corp.	Los Angeles, California
London Concrete Machinery Company, Ltd.	Brantford, Ontario
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Sonith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

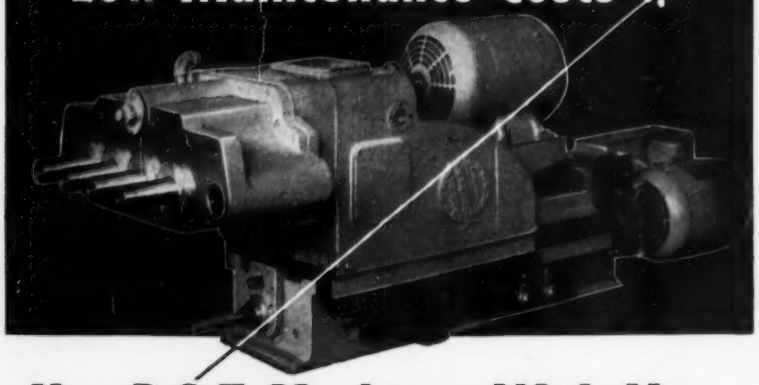
"This advertisement sponsored by foundries listed above."

Write for the new Meehanite Bulletin #37, "Proof That Meehanite Bridges the Gap Between Cast Iron and Steel".

MEEHANITE®

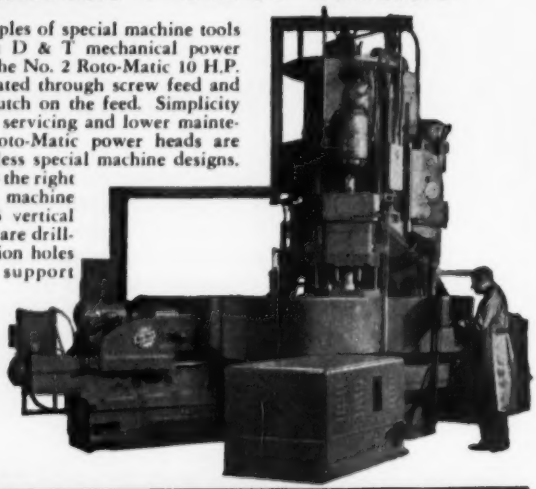
NEW ROCHELLE, N. Y.

For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

is available on the complete line of D & T machines. Ask for Bulletin 1000.

DAVIS and Roto-Matic THOMPSON

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

BUZZER Gas Fired **FURNACES**

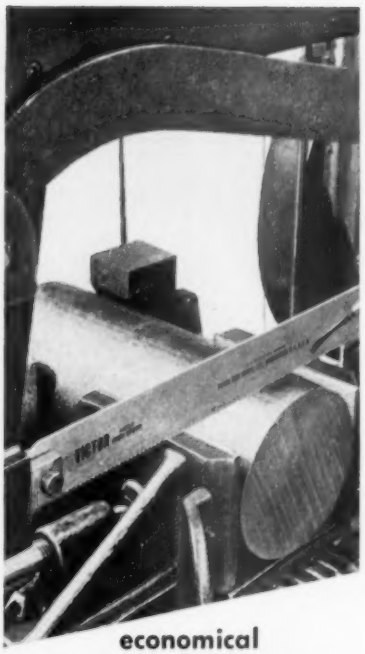
NO BLOWER OR POWER NEEDED . . . *just connect to gas supply*

Here's speed, economy and lifetime service in this most efficient and economical soldering and general purpose bench furnace. This #22 furnace heats a pair of 12 lb. soldering coppers in 8 minutes. Can be used for melting lead, heating small tools, etc. Since 1911 BUZZER Soldering Furnaces have been the equipment of thousands of industrial plants, shops and schools.

Write today for catalog showing various types of furnaces, burners and other equipment.

CHARLES A. HONES, INC.

121 Se[illegible]



economical metal cutting with

VICTOR "Moly" HIGH SPEED Power BLADES

Whatever your metal cutting problem, VICTOR "Moly"® High Speed Power Blades will cut your initial blade cost 15%, and give you the additional economy of more efficient cutting.

Quality makes VICTOR Blades industry's preference—top-quality, carefully heat-treated steel, fabricated on specially designed equipment, to give you fast, economical cutting and long blade life. Send for the free VICTOR Metal Cutting Booklet which tells you how to pick 'em—Gold "Moly"® High Speed or Silver Unbreakable High Speed.

ECONOMICAL SERVICE *from your* VICTOR DISTRIBUTOR

VICTOR "Moly"® High Speed Power Blades are always sold through the recognized Industrial Distributor because he is closest to your problems. You know and have confidence in him, and he can give you delivery from stock where and when you want it.

® 1922 VICTOR

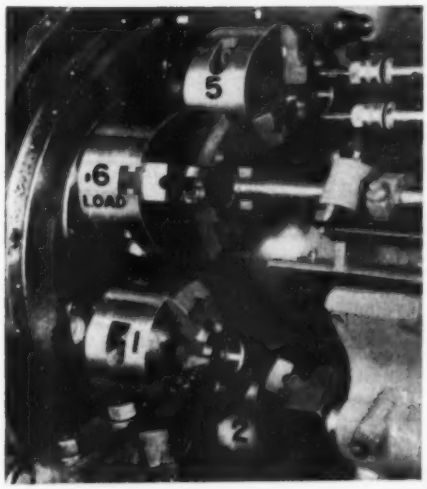
SAW WORKS, INC. • MIDDLETOWN, N.Y., U.S.A.

Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

ASK BAIRD ABOUT IT!

HIGH PRODUCTION TOOLING

A BAIRD CASE HISTORY



View of machine from front.

1
Finish turn flange O.D. (3.44"). Rough turn hub dia. Rough face flange and hub.

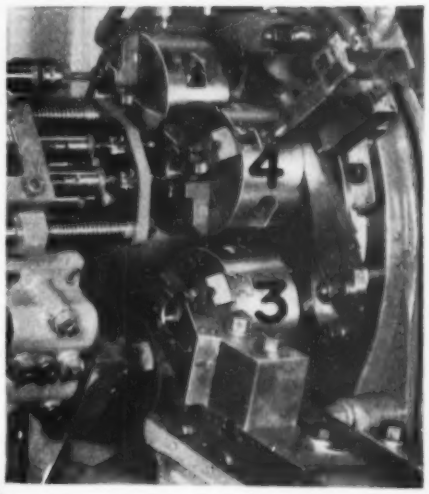
2
Chamfer I.D. Chamfer flange dia. and hub.

3
Finish turn hub, finish face flange and hub.

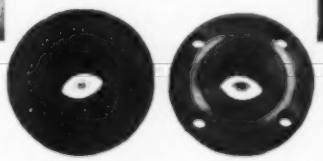
4
Drill and c'sink 4 holes — 23/64" dia. drill x 29/64" dia. C'sink, sub land drills. (Work held stationary when drilling.)

5
Tap 4 holes 7/16" — 14NC — 3. (Work positioned, held stationary, lead screw operated.)

6
Unload and load.



View of machine from rear.



The part . . . before and after machining.

FINISHING A CAST IRON PULLEY HUB...

PRODUCTION
Cycle time 23.12 seconds per piece.
Gross production 155 pieces per hour.

Here's another example of the way a single Baird High Production Machine can be tooled to handle a series of operations ordinarily not considered practical on a single spindle automatic unit. Note that, in addition to the usual concentric operations being performed on this hub, we are drilling, countersinking, and tapping accurately located bolt holes in the hub flange at just two stations in the cycle and at a very satisfactory production rate for the whole operation. Photographs show the tooling and relative simplicity of the set-up.

And, as in the case of all Baird No. 76 Chucker installations, this one is conspicuous for smoothness and dependability of everyday performance. Automatic chucking frees operator's hands for efficient, easy feeding. Automatic safeguards prevent damage to work, machine, or injury to operator in case of incorrect loading. Spindle speeds are independently adjusted to best performance of the individual operation.

To step up speeds, quality of work, reduction in costs, check the Baird Chucker. "Ask Baird about it."

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

1BA53

New Rotor B-35 Vertical Grinder with 6" cupwheel smooths a casting.

New Rotor B-35 Vertical Sander with 9" pad blends welds of machine base.

Speed up the job with these NEW ROTOR VERTICALS

YOU should try these new Rotor "power houses"! See how fast they remove metal. See how easy they are to handle . . . light in weight (only 10¾ lbs.) because of magnesium castings . . . comfortable balance because of adjustable handle angle.

Ask for a demonstration! Write for free copy of Catalog No. 40.

"The Ass in the Lion's Skin"

is a story for Cutting Fluid users

. . . with credit to Aesop, the Fable-Maker

An Ass dressed himself up in a Lion's Skin and ran about scaring the daylights out of the other farm animals. Then he tried to frighten his owner, the farmer. That was his downfall. The farmer soundly beat the stupid ass with a big stick, teaching him that he couldn't fool any sensible person by parading around as something he wasn't.

The Moral:

Different types of cutting fluids have their respective places in machining. Dressing a coolant up in a "Lion's Skin" doesn't change its capabilities. For example, if you have a difficult broaching job on a soft, tough steel *more than a "coolant" is needed.* You need the high *anti-weld* properties, the high *lubricity* and the superior temperature regulating qualities of a product like Stuart's ThredKut 99.

Stuart offers you a combination of time-tested products and wide experience in their application. You gain from this fewer rejects, longer tool life and greater production—often with *fewer* different cutting fluids in your plant. Ask to have a Stuart Representative demonstrate how he can save you time, money and material.

More Than a "Coolant" is Needed

D. A. Stuart Oil Co.
EST. 1865 LIMITED

TIME-TESTED CUTTING FLUIDS AND LUBRICANTS

2729 S. Troy St., Chicago 23, Ill.

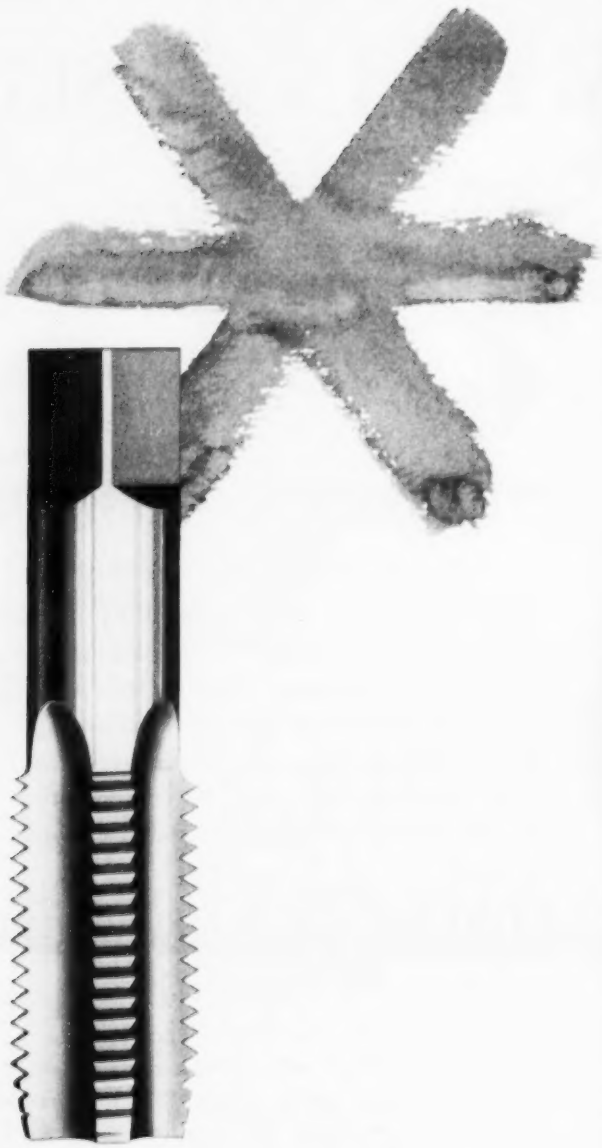
SEND FOR BOOKLET entitled *More Than a "Coolant" is Needed*

CLIP TO YOUR COMPANY LETTERHEAD AND MAIL

to D. A. Stuart Oil Co., Ltd., 2729 S. Troy St., Chicago 23, Ill.

Your Name .....

Title .....



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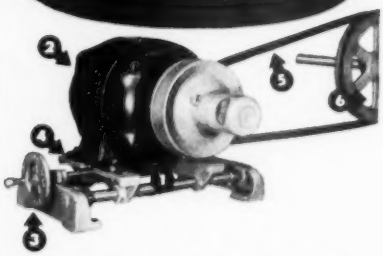
BAY STATE TAP & DIE COMPANY • MANSFIELD MASS.

✳ On nearby shelves of industrial supply distributors.

LOW-COST
VARIABLE SPEED
for light machinery

converts any standard
constant-speed motor
to a variable speed drive

REEVES
Vari-Speed Jr.



1. REEVES Vari-Speed Jr. is placed on motor shaft.
2. Any standard, constant-speed motor, ⅛ to 1½ hp.
3. Handwheel moves motor forward or backward for speed variation.
4. Sliding motor base.
5. Any standard V-belt.
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Widen the work range of your light machines by installing REEVES Vari-Speed Jr. Easily applied . . . provides stepless speed adjustability in ratios up to 2¼ to 1. No intricate mechanisms . . . no chain drives, gears, multiple belts, etc. Write for complete information to Dept. A9.

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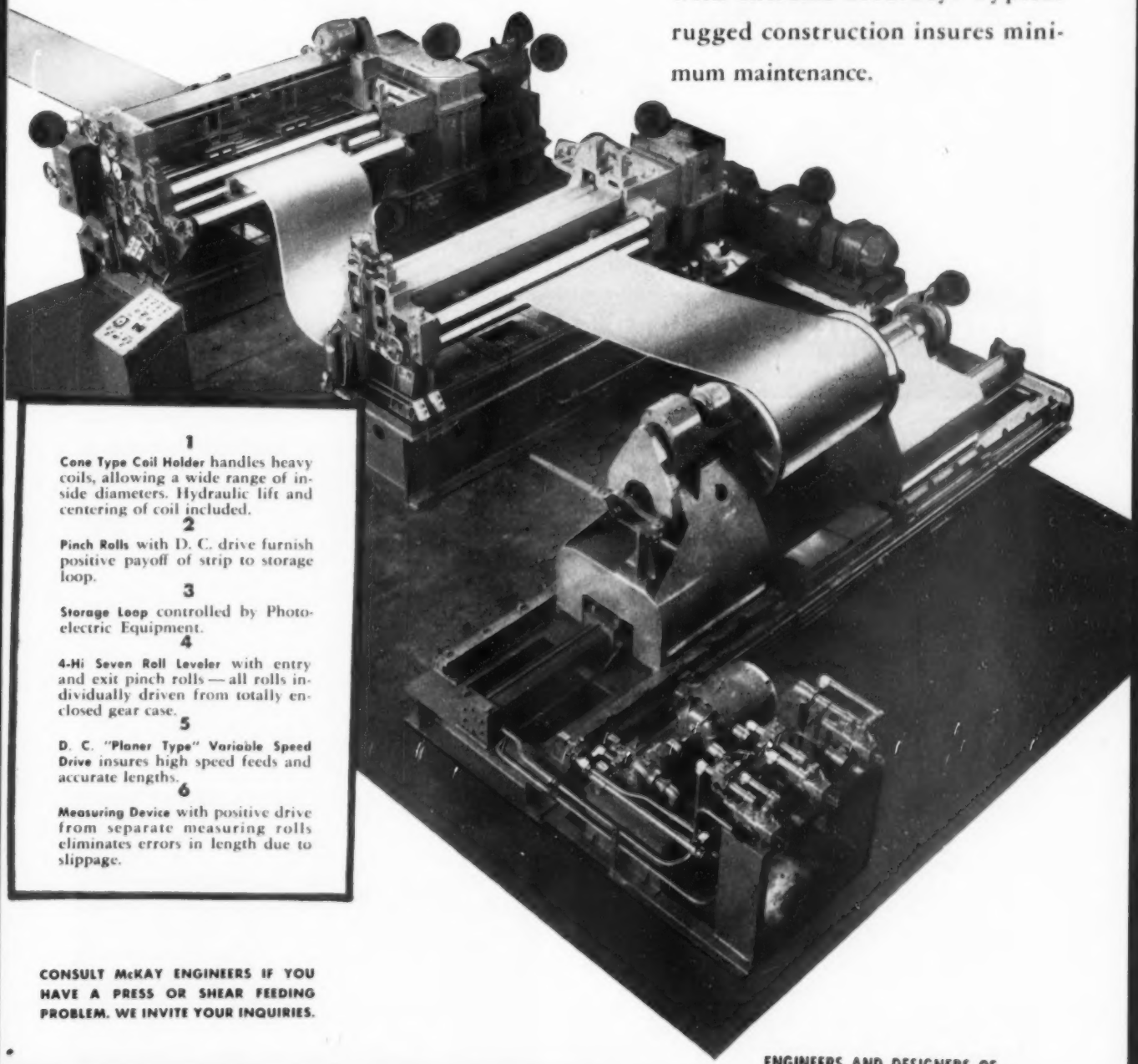
REEVES
Variable Speed Drives

McKAY

PRESS FEED AND CUT-UP LINE

A New Answer to COIL FEEDING *Problems*

Incorporating the latest in D.C. drive and control, McKay's *new* feeding line provides high production with extreme accuracy. Typical rugged construction insures minimum maintenance.



1

Cone Type Coil Holder handles heavy coils, allowing a wide range of inside diameters. Hydraulic lift and centering of coil included.

2

Pinch Rolls with D. C. drive furnish positive payoff of strip to storage loop.

3

Storage Loop controlled by Photoelectric Equipment.

4

4-Hi Seven Roll Leveler with entry and exit pinch rolls — all rolls individually driven from totally enclosed gear case.

5

D. C. "Planer Type" Variable Speed Drive insures high speed feeds and accurate lengths.

6

Measuring Device with positive drive from separate measuring rolls eliminates errors in length due to slippage.

CONSULT McKAY ENGINEERS IF YOU HAVE A PRESS OR SHEAR FEEDING PROBLEM. WE INVITE YOUR INQUIRIES.

ENGINEERS AND DESIGNERS OF EQUIPMENT FOR THE AUTOMOTIVE, FABRICATING AND STEEL INDUSTRIES

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A Name On Which To Rely

THE NEW DOUBLE ECCENTRIC ADJUSTABLE DRILL HEAD

Practically universal adjustment. 2 to 8 spindle, standard. Also specially designed heads.

Built for continuous use with full anti-friction bearing construction for high capacity thrust loads...precision-bored outboard spindle support plate.

UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

We manufacture all types of multiple spindle, fixed center and lead screw tapping head:

US HEADS SINCE 1915

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REIDEN MILLING MACHINE

STOCK DELIVERY!

PARTIAL SPECIFICATIONS

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Working surface	14¼" x 59"
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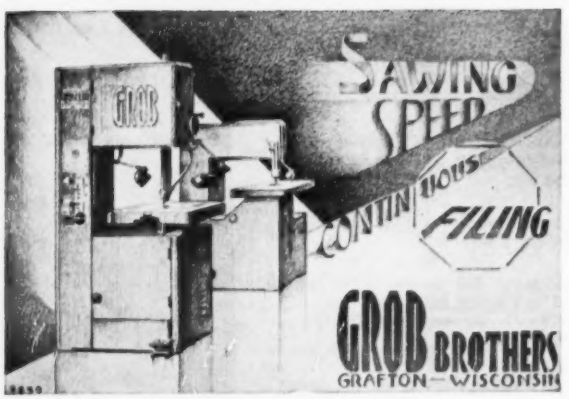

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COUPLING BOLTS
MILLED STUDS
CAP SCREWS
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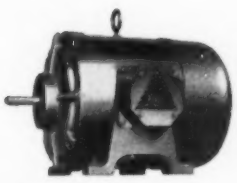
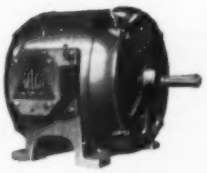
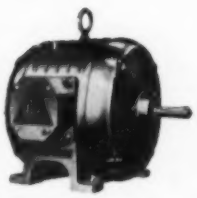


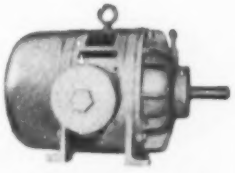
Totally Enclosed Fan-Cooled Motor



Open Ball-Bearing Motor



Totally Enclosed Motor



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Knuckle Joint Press

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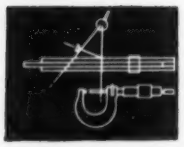

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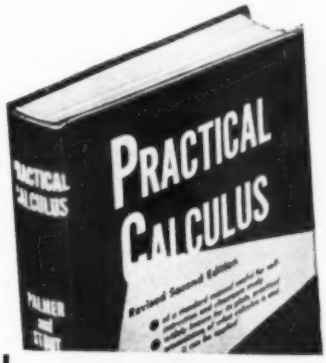

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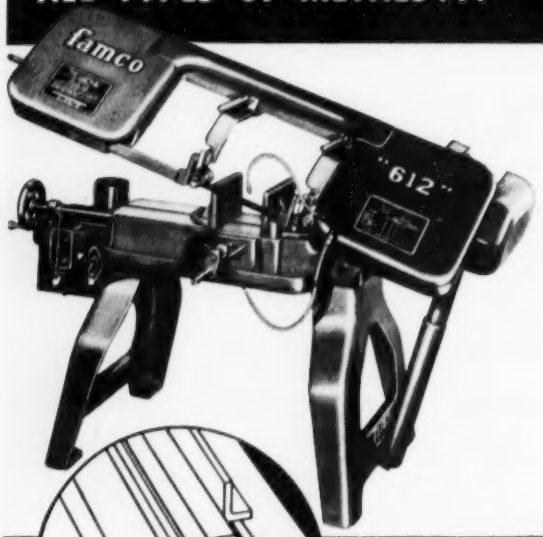

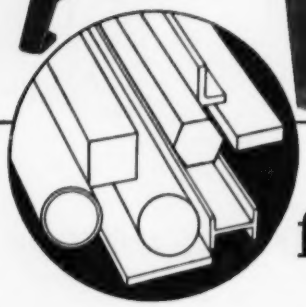

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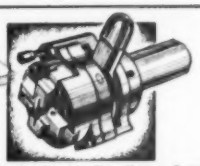

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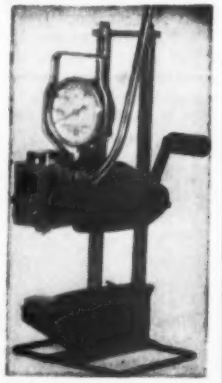

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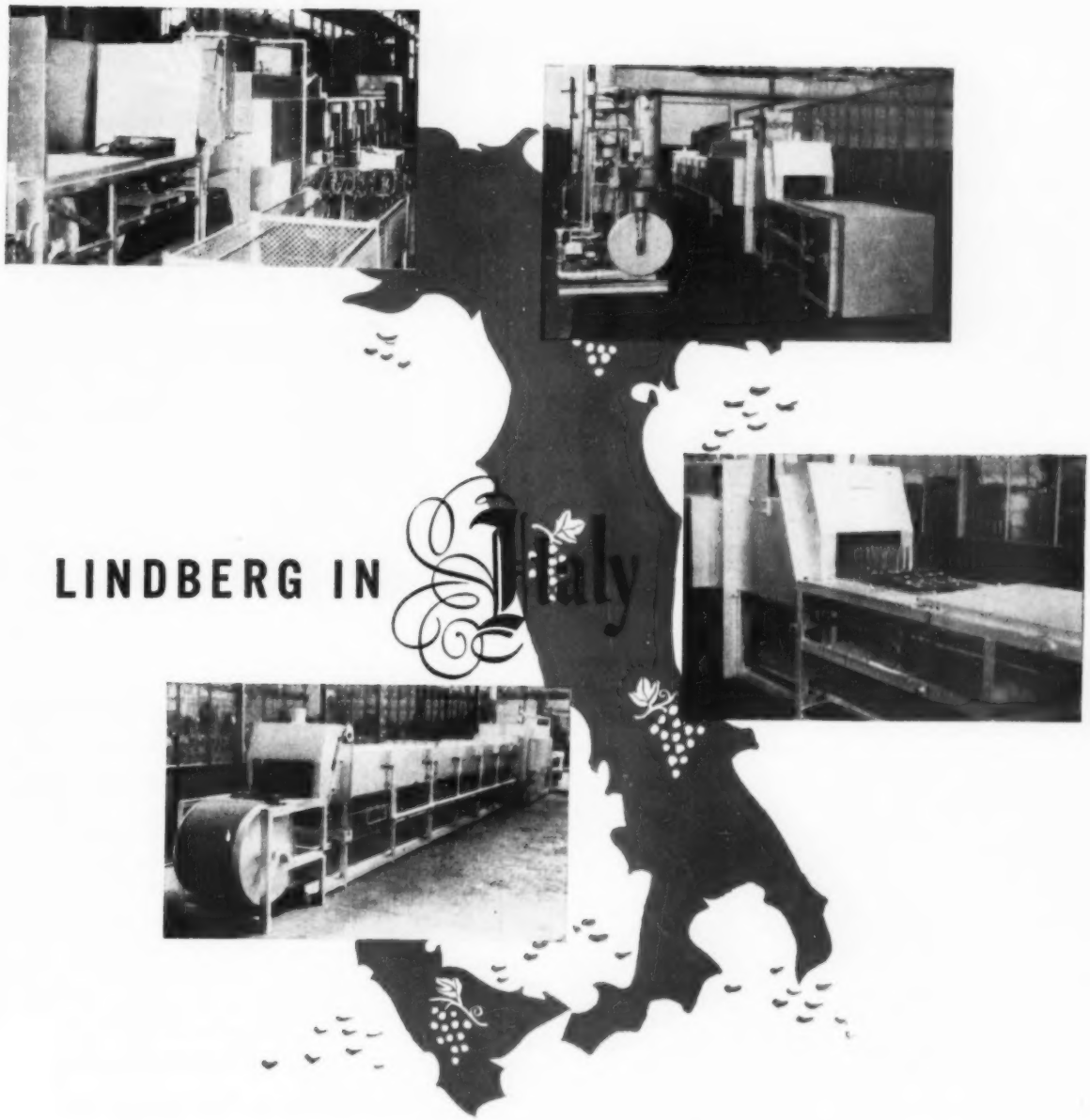

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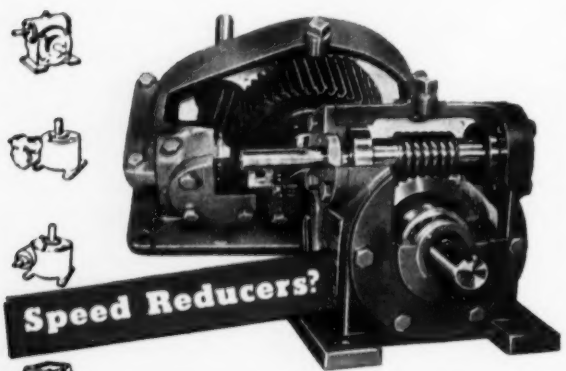

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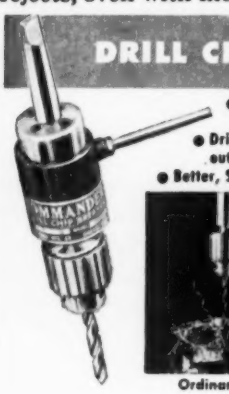

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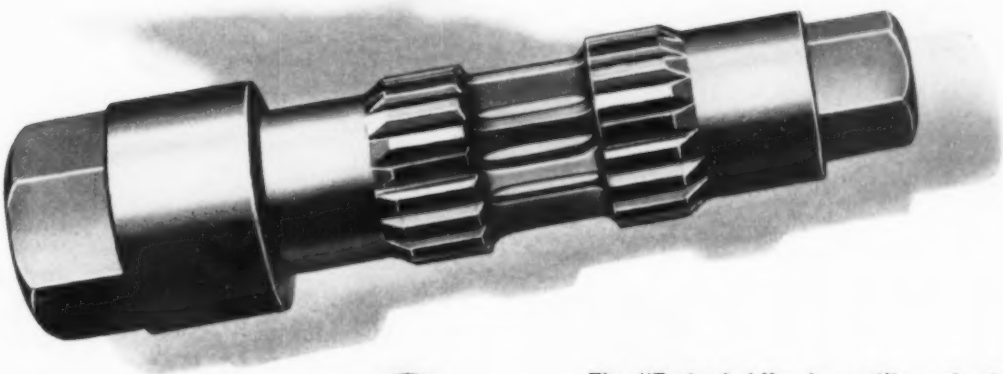

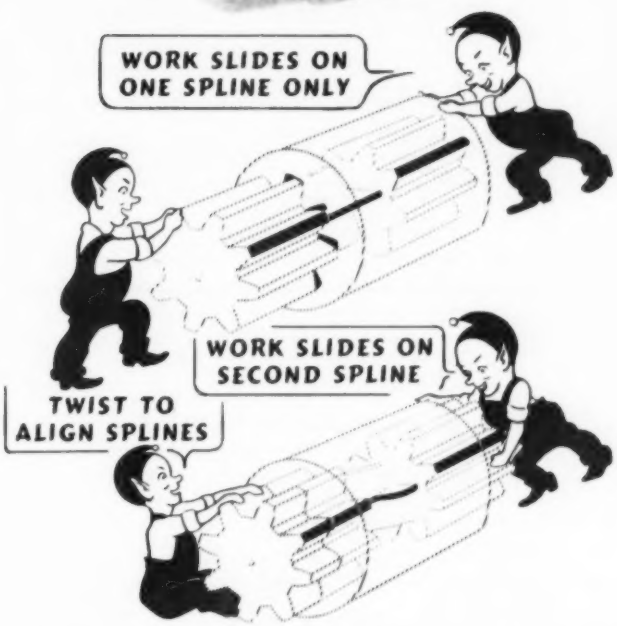

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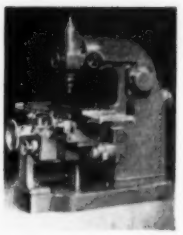

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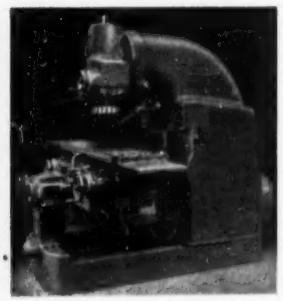

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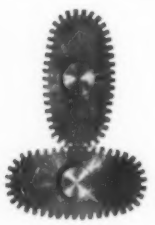

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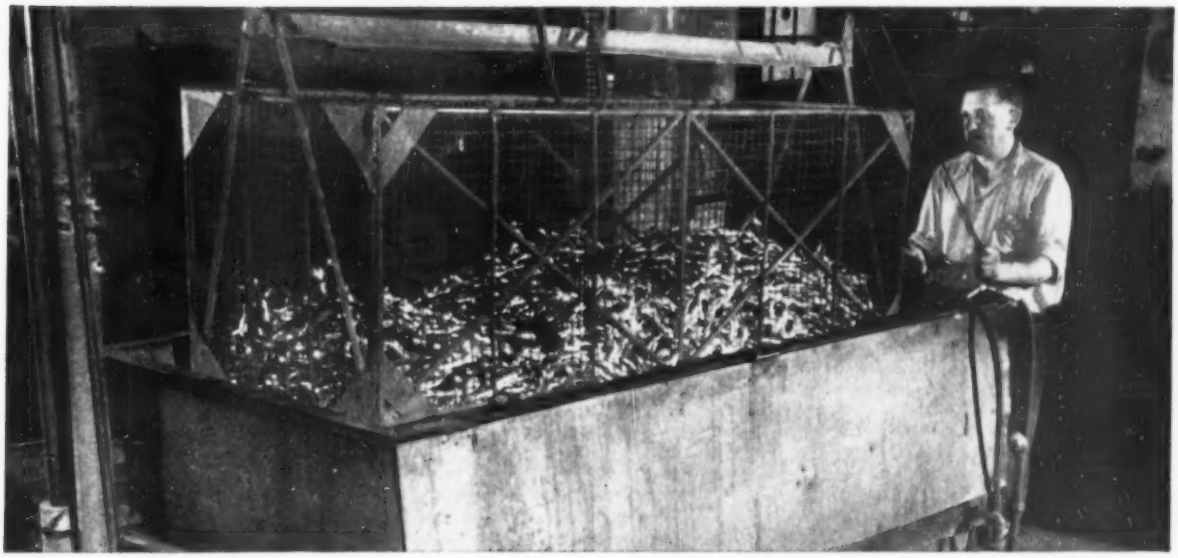

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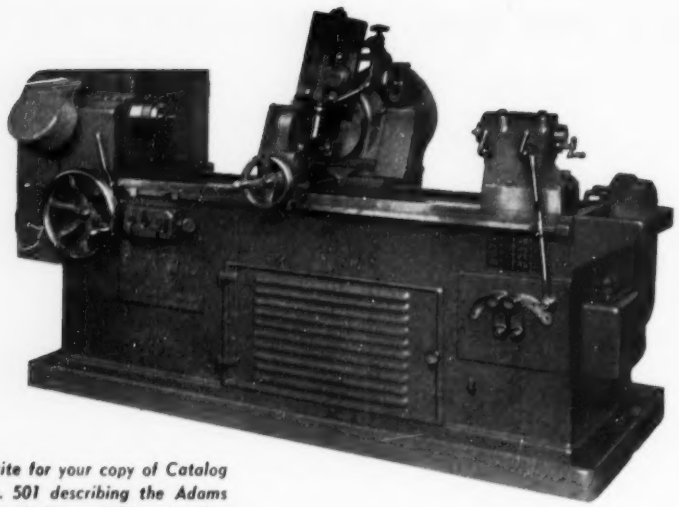

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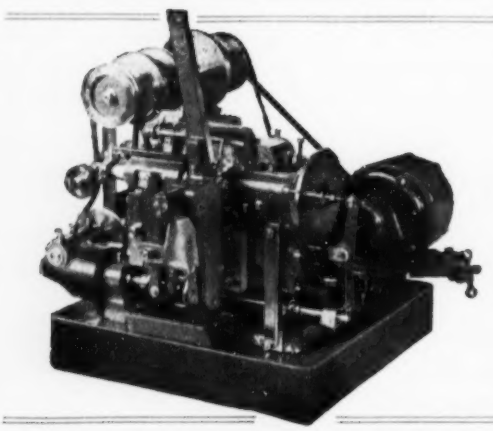

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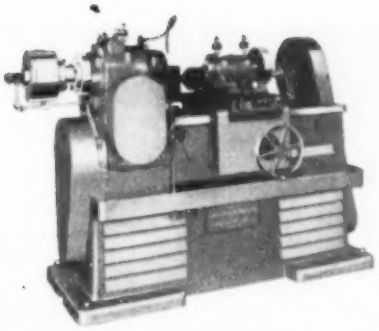
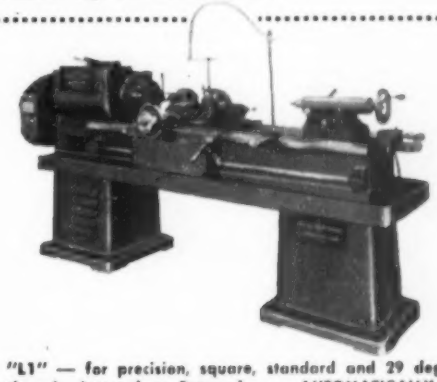


"H1" — for precision, internal, external, right and left hand threads . . . AUTOMATICALLY.

EXCLUSIVE ADVANTAGES:

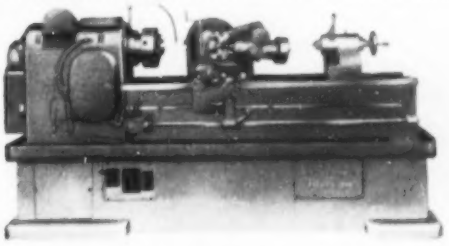
- High speed drive to work spindle.
- New, wider range of speeds and feeds.
- High speeds for non-ferrous metals.
- Slow speeds for heat treated materials.
- Motors enclosed . . . easily accessible.
- Quick change over for short runs.



"L1" — for precision, square, standard and 29 degree threads. Internal or External . . . AUTOMATICALLY.

EXCLUSIVE ADVANTAGES:

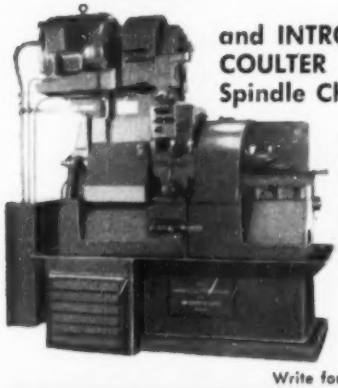
- Four speed headstock.
- Return or idle travel speed increased five times cutting speed.
- Disc clutch. Start and stop easily.
- Operator always has control.
- Individual adjustments to both front and rear tool slides.



"THREADMASTER" — for precision, long and short traversing, elevating, cross feed and lead screws . . . AUTOMATICALLY.

EXCLUSIVE ADVANTAGES:

- Cutter head design permits full size cutter spindle.
- Use a plain or anti-friction bearing spindle in same housing.
- Conventional or climb cutting possible.
- Wide range of speeds and feeds.
- Takes small or large diameter work.
- Full size spindle.
- Use high speed steel or carbide cutting tools . . . on any materials.



and INTRODUCING THE NEW COULTER "T5" . . . Single Spindle Chucking Machine.

Now, drill, ream and counter bore, face and form turn . . . automatically. Here are multiple operations in one chucking.

EXCLUSIVE ADVANTAGES:

- 3 times faster.
- No second operation needed.
- Use any materials, with carbide tools.

Write for complete information. Tell us your problems, our engineers can help you.

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FREE TRIAL OFFER
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A VALUABLE KIT
Carton contains 6 grades of ultra-fine quality, assorted fine grit abrasive compounds suitable for a variety of work. Coarser grit compound can also be supplied.

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Here's a get-acquainted offer you cannot afford to miss. Among these samples will be found the answer to many a tool room lapping problem. Hard and soft abrasives for all kinds of lapping needs. Sent post paid anywhere in the U.S.A. and Canada.

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Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

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Here's how you can triple your tool life on all types of line and piloted reaming jobs—use Staples Shell Type Expansion Reamers. To compensate for wear, reamer shell expands to original diameter by driving it up the tapered arbor. Re-expand shell until maximum carbide utility is reached. A new tool is obtained simply by replacing the worn shell—a standard item. Many design variations of this tool are possible, including use of two shells of different diameters for step reaming.

For maximum tool economy, specify Staples Carbide-Tipped Circular Tools for reaming, core drilling, spotfacing, counterboring and end milling jobs. Quick delivery of standard tools from stock. Special tools designed to your requirements. Write for tool catalog.

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THE STAPLES TOOL COMPANY, Cincinnati 25, Ohio
Distributors in Major Cities
Staples CARBIDE-TIPPED CUTTING TOOLS
A complete line of Circular Carbide-Tipped Cutting Tools Expansion Reamers Special Tools

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE
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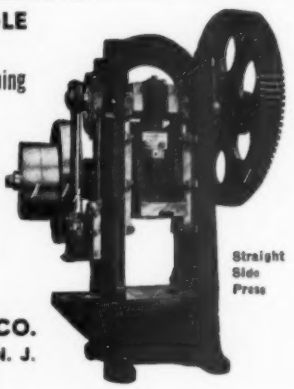
STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



Straight Side Press

ZEH & HAHNEMANN CO.
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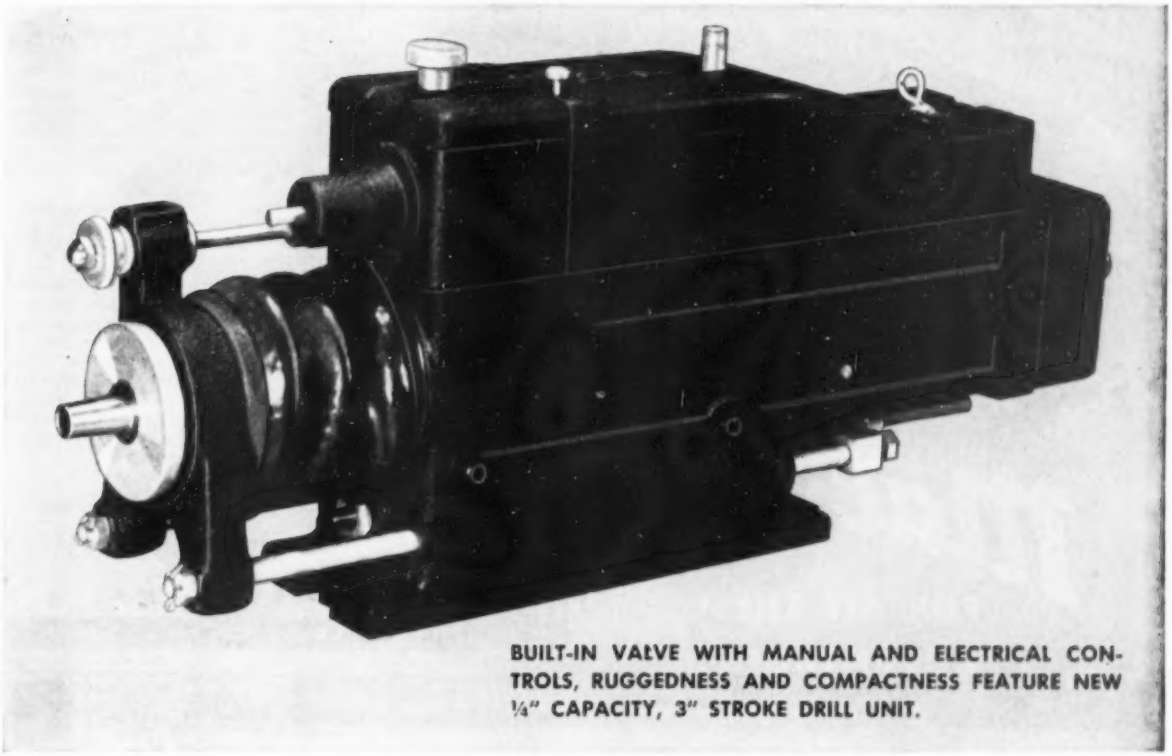
BELLOWS-LOCKE DRILL UNIT COMBINES HYDRAULIC FEED, AIR-POWERED TRAVERSE, ELECTRICALLY DRIVEN SPINDLE



BUILT-IN VALVE WITH MANUAL AND ELECTRICAL CONTROLS, RUGGEDNESS AND COMPACTNESS FEATURE NEW ¼" CAPACITY, 3" STROKE DRILL UNIT.

PRECISION adjustable hydraulic controlled feed rate, coupled with rapid air-powered advance and retract, and a full 3" drilling stroke, make the Bellows-Locke Drill Unit an important component in tool-room-built special purpose machines. Feed rate is infinitely adjustable from 0" per minute up to the maximum speed of the air-powered movement as determined by the air line pressure used.

This special purpose machine at The Perry-Fay Co., Elyria, Ohio, uses 8 Bellows-Locke Drill Units to drill twelve 7/32" holes in less than 1-1/2 seconds.

The Bellows-Locke Drill Unit can be mounted horizontally, vertically, or at any angle. Its small size (21-1/16" long by 3¼" wide by 7-11/16" high) lends itself to space saving design. Used with a 1750 RPM motor, spindle speed range is adjustable from 690 to 4630 RPM through the Bellows Speed-Selector Pulley. (Motor and Speed Selector Pulley are optional.)

As standard, the unit is equipped with built-in directional air valve with built-in solenoid, as well as manual start and stop controls. It is available with optional electric controls to provide deep hole drilling with automatic drill cleaning, or time controlled dwell. The Bellows-Locke Drill Unit can be factory equipped with any standard tapping head.

The Bellows Co.

AKRON, OHIO

See your local Bellows Field Engineer or write direct for a copy of the Bellows-Locke Bulletin. Address Dept. AM-253, The Bellows Co., Akron, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., 4972 Dundas St. W., Toronto 18, Ontario. 651A

STRENGTH WITHOUT BULK

The exceptional tensile and torsional strength of Mac-it Screws makes it possible to use smaller, lower cost screws for all fastening jobs. Mac-it Special Alloy Steel used in all Mac-it Screws is held to rigid specifications, assuring uniform and dependable screw fasteners.

PRECISION FASTENERS

The precision manufacture and quality control used in making Mac-it Screws provide users with high dimensional accuracy and uniformity. All Mac-it Screws in both coarse and fine threads are held to a class-3 fit.

MAC-IT SCREW ENGINEERING

Mac-it maintains a fastener engineering service for the design, development and production of screws to suit all types of applications.

SPECIFY **Mac-it** FOR ALL THESE ADVANTAGES

ONE MAC-IT CALL GETS 'EM ALL!

SPECIAL SCREW PRODUCTS

Mac-it is geared for either large or small run production of screws with special design or strength characteristics.

HEAT-TREATING

Mac-it heat-treatment is more than a mere case hardening or surface processing. The high quality of Mac-it Special Alloy Steel adapts it to heat-treatment that penetrates throughout the structure of the screw so that the center possesses the same sturdy toughness possessed by the outside. Proved formulas govern this process.

Each type Mac-it Screw is heat-treated to possess maximum strength for the particular purpose for which it is to be used. No one heat-treatment is best for all purposes.

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Contact any of the hundreds of Mac-it distributors from coast to coast for immediate service to supply your requirements for standard or special screws.

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Manufactured by Mac-it Parts Co., Lancaster, Pa.

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These stamps are made of the finest alloy steel, heat treated to stand continuous impact without breakage of face or mushrooming of body. They are made for marking flat or contoured surfaces.

There is a stamp for marking every product from pig iron to welding rings, watch cases and silverware. Letters and figures of any style may be had. The practical range of face sizes is 1/32" to 1/2". Special stamps for marking wood, either way of grain, are also available.

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HOGGSON STEEL STAMPS ★

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SCHERR MAGNI-RAY — The Illuminated MAGNIFIER for PRECISION INSPECTION

Oblique rays make scratches and defects stand out clearly.
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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

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RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

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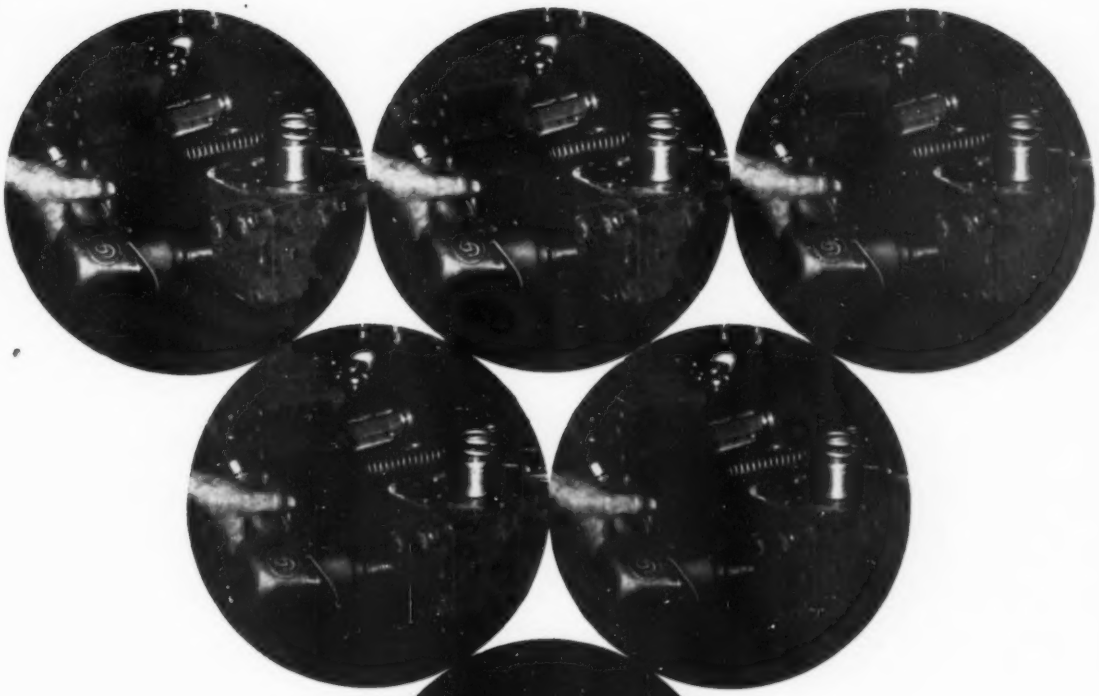

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for production line and maintenance

Save valuable time – get more work done at far less cost with a CP-3440 Reversible Air Impact Wrench. It's designed for faster, low-cost nut running in production line and maintenance. The CP-3440 is only 6 inches long – weighs only 4½ pounds. Complete ease of handling reduces operator fatigue to an absolute minimum.

Chicago Pneumatic Air Impact Wrenches are supplied in seven models in sizes ranging from ¼ to 1¾ inch bolt size. And for reaching hard-to-get-at places they're available with angle heads in all sizes. Can be used for driving and removing wood and lag screws, studs, and tapping. For more details, write for Catalog 564.

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ELIMINATE METAL WASTE!

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With extreme precision and continuous cutting with no backstroke, it slices away hard alloys and carbon steels in one-tenth the time required by slow milling, drilling, shaping and hand filing.

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Does all the same types of work that machines costing $1800.00 will do, yet costs less than $500.00.

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High quality, low cost tools for cutting, shaping, drilling and finishing wood, fibre, metals and plastics.

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Please send free literature on the Boice-Crane Contour Saw-Band Filer-Belt Grinder.

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Fluorescent Lighting for

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And Others Engaged In Close Work

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Engineering Service on Your Metal Forming Problems

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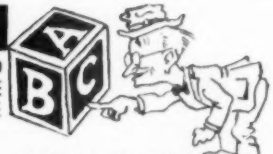
ELEMENTARY



A BORING HEAD THAT WON'T FACE IS NOT COMPLETE

NEW

Re-designed
Added
Features
. . . SIX SIZES

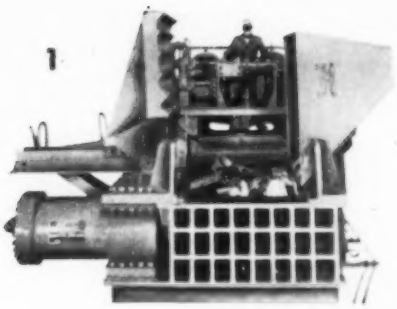
BORING, FACING, TURNING, GROOVING, UNDERCUTTING—IN ONE TOOLHEAD

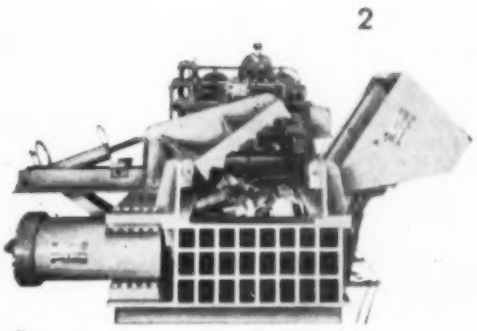
ALL HAVE POWER FEED FOR FACING

CHANDLER TOOL COMPANY, MUNCIE, IND.

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

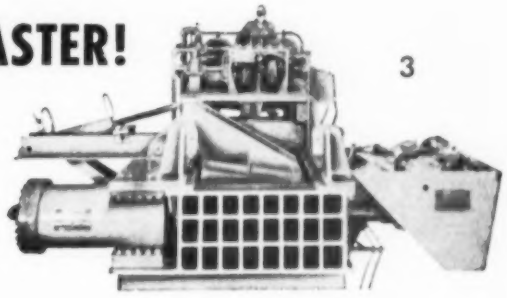




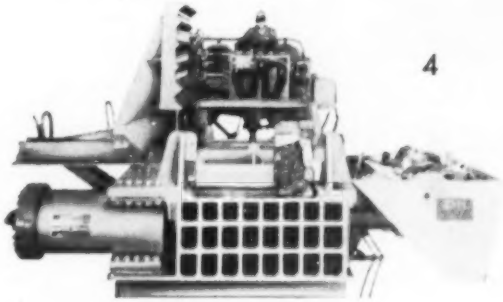
THE DEMPSTER-BALESTER

1-2-3-4 Hydraulic Operation

BALES YOUR SCRAP METAL FASTER!



The key to low cost scrap metal baling is fast, consistent baling. The big capacity *Model "600" Dempster-Balester* high speed press pictured here will bale your scrap as fast as your crane can feed it! This tremendous baling speed is due to the Dempster-Balester's 1-2-3-4 hydraulic cycle. 1—Skip Pan Loader loads charging box (see Photo 1). 2—Skip Pan returns to loading position as Auxiliary Compression Door compresses scrap with a 45-ton force. (see Photos 2 and 3). 3—Charging box door is closed and scrap is baled, then 4—finished bale, weighing between 600 and 1,000 pounds, is ejected. (see Photo 4). Without question, *Dempster-Balesters* are the fastest, most efficient presses baling scrap! For complete information clip coupon below and mail to us today. A product of Dempster Brothers, Inc.



DEMPSTER BALESTER

CHECK BELOW INFORMATION DESIRED

- ☐ Dempster-Balester Model "600". Produces 600 to 1000 lb. bales.
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Uniform Rake Angles on Taps Can Save You Money

The importance of rake angles on milling cutters, lathe, planer, and shaper tools has been recognized for many years. Yet the importance of uniform rake angles on the cutting edges of taps is frequently overlooked.

ADVANTAGES OF UNIFORM RAKE ANGLES

Case history studies in plant after plant show that rake angles that stay the same —after many repeated sharpenings—provide much greater accuracy and uniformity in work produced. They also result in greater production per tap and big savings in tap costs.

THE ROLE OF BLAKE EQUIPMENT

The Blake Flute Grinder and Blake Chamfer Grinder are the only machines which enable you to control accurately the rake angle of any tap. By using these two machines, you can duplicate a rake angle which was found previously to be satisfactory. The same rake angle also can be given to as many other taps as desired.

BLAKE EQUIPMENT IS DESIGNED FOR PRECISION!
Photograph shows construction of crank shaft unit of chamfer grinder workhead which helps make precision sharpening possible.

THE MONEY-SAVING STEP IS YOURS

You have the opportunity to greatly increase your production per tap and sharply reduce your tap costs by using the Blake precision sharpening method in *your* plant. To get more facts on the subject, write us for the interesting *Machinery* article, "Why Taps Should Be Sharpened Precisely". Illustrated bulletins on both Blake machines are also yours for the asking.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!

BLAKE CHAMFER GRINDER (Described in Bulletin 552)

BLAKE FLUTE GRINDER (Described in Bulletin 651)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

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BLACK DIAMOND PRECISION DRILL GRINDERS . . . WALTHAM CUTTER SHARPENERS . . . SURFACE FINISH STANDARDS

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Used and endorsed by tool and die, electronic, machine, plastics, radio, electrical and instrument manufacturers. A real money saver.

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A LITTLE DOES A LOT

Moly-sulfide, a solid film lubricant, stands out most where the lubricating conditions are the most difficult. If you have to contend with extreme conditions of pressure, temperature, fretting, or velocity, you should try ***Moly-sulfide***. First write for a copy of this free 40-page booklet which shows where the above conditions have already been overcome in the shop and in the field.

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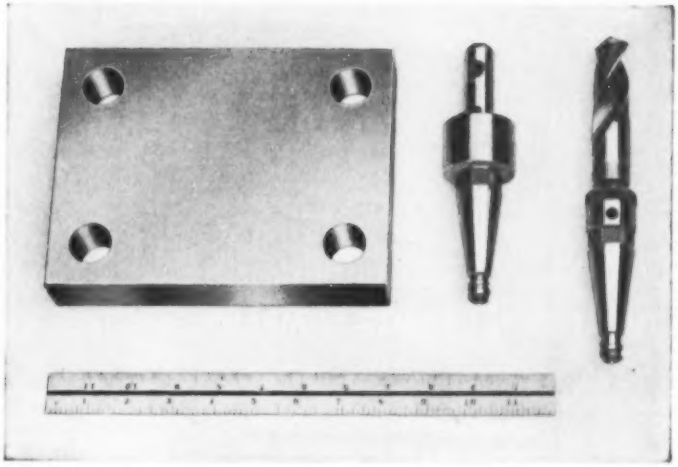
AM-2 MS 7-A

Hole Location Practices

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Company, Inc., 738 Union Avenue, Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Die Flippers, Motorized Centers and a complete line of Hole Location Accessories.

4 HOLES to ±.0002" in 8 MINUTES

How would you do it?



The only tools used to complete this Jig Borer production job were the drill and carbide bit. The carbide bit will hold size for four holes. The last hole is measured and the tool bit set for the next piece.

Sixteen of these pieces were needed. The four 1" holes are 1⅝" deep—with location and size tolerances ±.0002". It would be impossible to obtain such accuracy using a drill jig—and impractical on this short run. Then how could you locate, drill, bore and check the four holes in only 8 minutes?

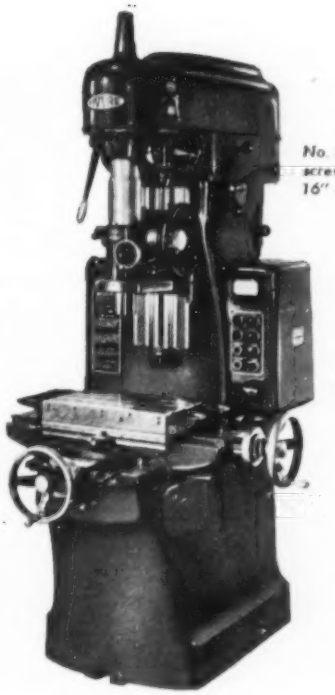
HERE'S HOW:

Using a No. 2 Moore Jig Borer with one 31/32" drill and one cut carbide bit, all sixteen pieces (64 holes) were finished in 2 hours and 38 minutes!

FIVE SIMPLE STEPS:

1. Load piece (no fixture needed)	30 sec.
2. Locate and drill 4 holes with 31/32" drill at 800 RPM	240 sec.
3. Bore holes with carbide bit at 1600 RPM	120 sec.
4. Check last hole and reset bit for next piece	60 sec.
5. Unload	30 sec.
Total time per piece	480 sec. or 8 min.
Total for 16 pieces (including 30 min. set-up time)	2 hrs. 38 min.

Why make a costly drill jig for those short production runs—or worry about keeping work within close tolerances? The Moore Jig Borer is a necessity in the toolroom; let it help you on tough production jobs, too. We have case histories which we will be glad to send you. Write today.



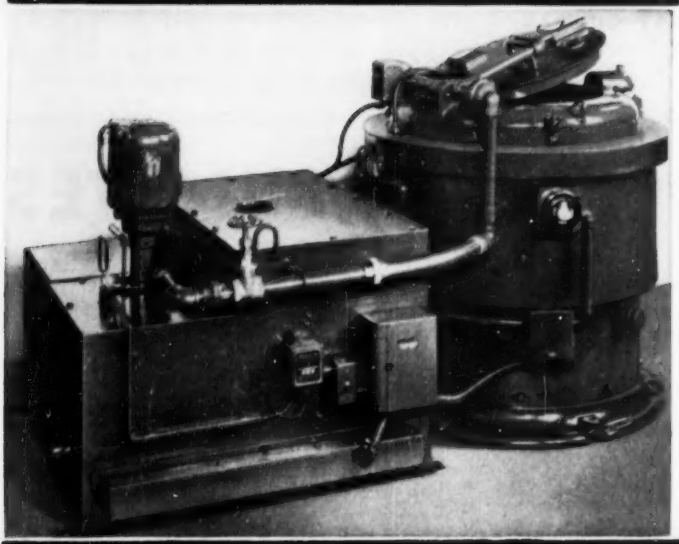
No. 2 Moore Jig Borer has lead screws accurate to 0.0002" in 16" of travel

see our catalog in

MACHINE TOOL CATALOGS

or write for copy

CONTROLLED IMPREGNATION by the BARRETT "HYDEWA" Centrifugal Process offers many advantages



The Centrifugal Process is limited in application only to the size of the articles that may be rotated in fair balance in the revolving bowl. Coils, condensers, transformers, braiding cotton insulated wire, paper tubes, pressboard spacers, rawhide and bristles, are but a few of the many typical products now being processed in Barrett Impregnators. Many products heretofore considered impractical for satisfactory impregnation by other methods have been successfully handled.

The Barrett Method assures fast production, by reducing the customary hours to minutes, high penetration, with controlled impregnation, also positive expulsion of air from the articles being impregnated.

Basic units are self-contained, direct motor driven. Special arrangements and supplemental equipment also provided.

Submit your problem and samples for test and recommendations.

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Designers and Builders of Centrifugal Machinery

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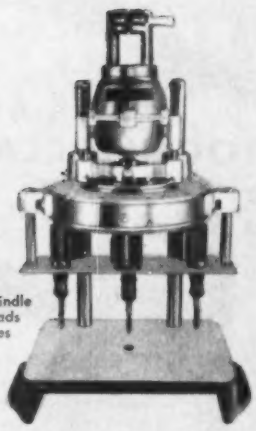

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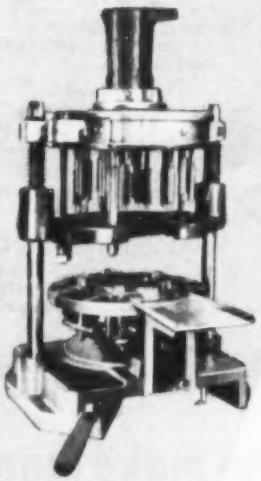

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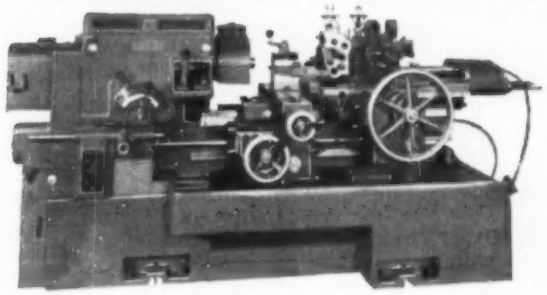

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The 40-E Automatic Cycle Turret Lathe is designed particularly for rapid production on long or short runs, at reduced costs; with simple set-up and complete ease of operation.

	Approx.
Hole through spindle	1-7/8"
Capacity	1-9/16"
Swing over bed	18"
Swing over saddle guide	16"
Swing over cross slide	9"
Speeds	500-3000 RPM
Hex turret:	
Feeds	.00315"-.0205"
Carriage feeds:	
6 Longitudinal and cross	.0008-.0110
6 Fine longitudinal and cross	.00315-.0374
Diameter of hole in hex turret	1-3/4"
Maximum travel of ram	8-11/16"
Max. distance between spindle nose & turret face	25-9/16"
Bar Feed Equipment	
Chucking Equipment	
Motor 3/60/220—4 speed	4, 4½, 5½, 7 HP

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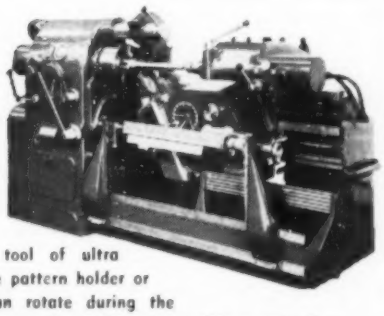
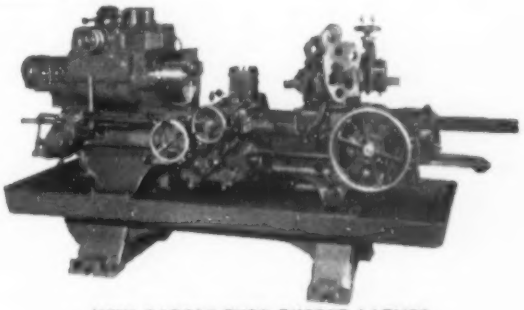


Exceptionally fine tool of ultra modern design. The pattern holder or template holder can rotate during the saddle return movement, thus making it possible to take 2 or 3 cuts on the same piece.



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Here in a compact self-contained unit, you have the high precision that has found so prominent a place in the jet engine program. By unique design, Comtorplug gives true 2-point gaging, self-aligned and centered. Thus it enables you to check any part of a hole—including very bottom—detecting out-of-round, front or back taper, bell mouth, etc.

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- Shows actual measurement to fraction of .0001", and is "just right" for Statistical Quality Control programs.
- No skill needed to use it accurately—built-in features and 10 minutes' instruction do the trick.
- Marvelous thing about Comtorplug from production man's viewpoint is that you can put it to work in your shop without any planning, wiring, air lines or rigmarole—just a simple briefing on its use.
- Comtorplug is a rugged, shockproof instrument. Use it for size control at the machine as well as bench inspection, wherever you produce precision holes in volume.

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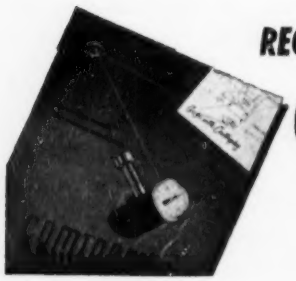

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"There was no time to stop, see? She comes running out from behind this parked car right under my wheels. Her hair is in pigtails, and with the sun shining on it, she might have been *my* kid. We got her to the hospital. It took 3 pints of blood to bring her around. All I have to do is remember the sound of those screaming tires—and I know why *I'm* giving blood."

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If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

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- ☐ Has your company given any recognition to donors?
- ☐ Do you have a Blood Donor Honor Roll in your company?
- ☐ Have you arranged to have a Bloodmobile make regular visits?
- ☐ Has your management endorsed the local Blood Donor Program?
- ☐ Have you informed your employees of your company's plan of co-operation?
- ☐ Was this information given through Plant Bulletin or House Magazine?
- ☐ Have you conducted a Donor Pledge Campaign in your company?
- ☐ Have you set up a list of volunteers so that efficient plans can be made for scheduling donors?

Remember, as long as a *single* pint of blood may mean the difference between life and death for *any* American . . . the need for blood is *urgent!*

Give Blood Now

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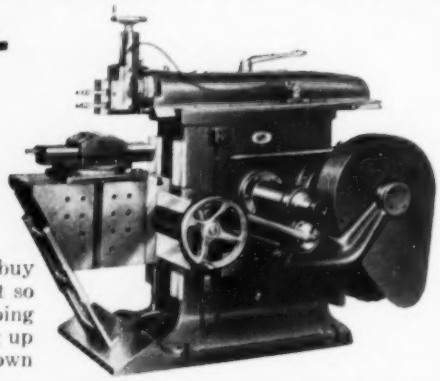
NATIONAL BLOOD PROGRAM

Now ~~72~~ 93 Busy Plants Are Cutting Machining Costs with KLOPP High-Production Shapers



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Write for names of prominent KLOPP users near you. And ask us to quote on your requirements for one or a battery of these fast-producing cost cutters.

Engineered servicing from Orban Service Centers in Cleveland, Detroit, Newark. Stock parts from Cleveland.

SPECIFICATIONS

MECHANICAL SHAPERS—stroke lengths 16¾", 20⅝", 26⅝". Six rates of speeds with normal motor, 12 with two-speed motor. Accelerated return motion. Single lever control within easy reach of operator. Swivel work table can be set to either side at any angle up to 90°.

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hiding behind poor cost control

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How to set up **charts for plotting a curve of expenses.** There's only one sound way to do this, says this engineer-manager, and he tells you how to draw the curve, how to adjust the curve, how to read the curve.

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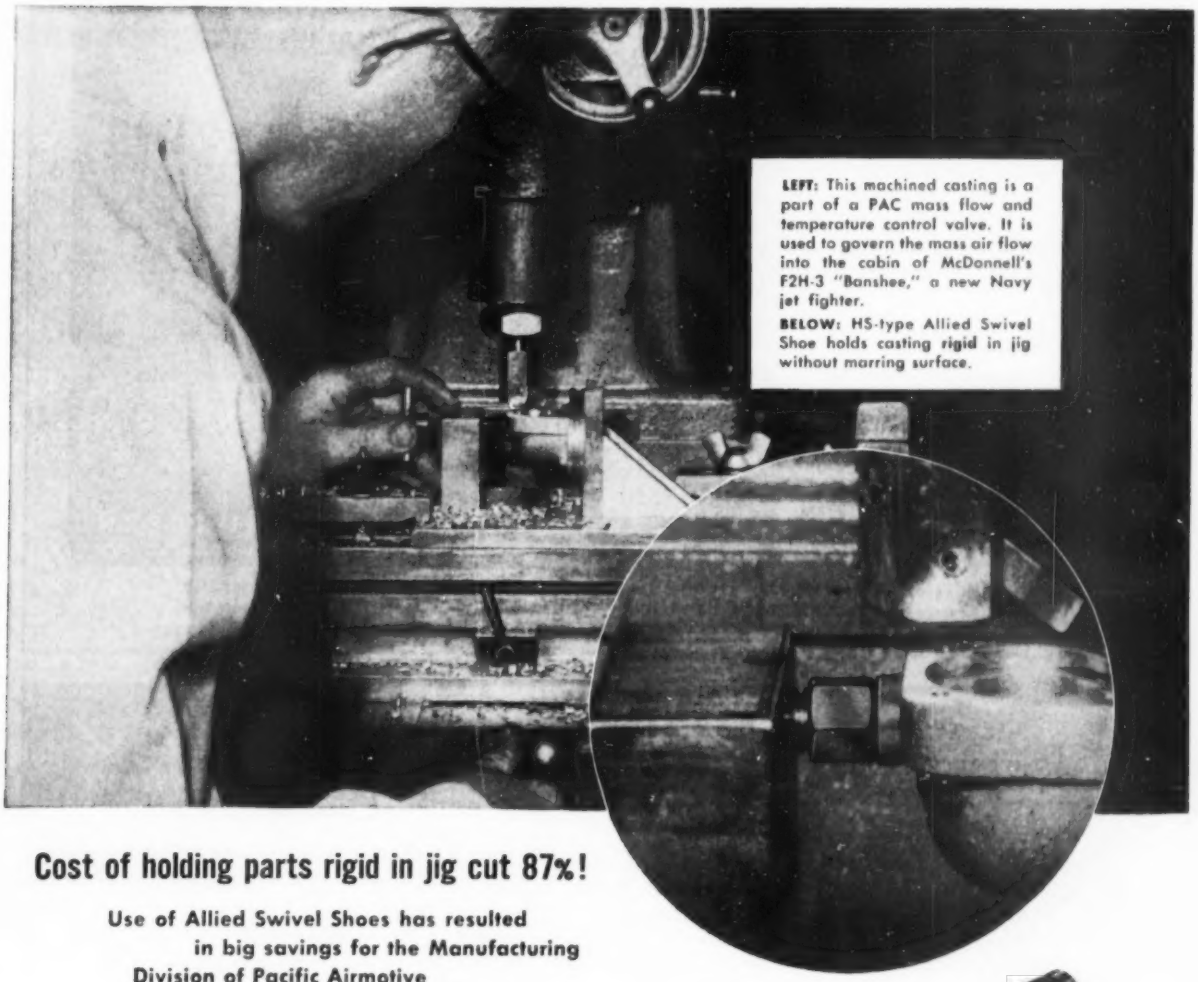

LEFT: This machined casting is a part of a PAC mass flow and temperature control valve. It is used to govern the mass air flow into the cabin of McDonnell's F2H-3 "Banshee," a new Navy jet fighter.

BELOW: HS-type Allied Swivel Shoe holds casting rigid in jig without marring surface.

Cost of holding parts rigid in jig cut 87%!

Use of Allied Swivel Shoes has resulted in big savings for the Manufacturing Division of Pacific Airmotive Corporation, Burbank, California.

Formerly, parts were held in jigs and fixtures with makeshift swivel shoes machined on the job. Cost-conscious tool designers at PAC standardized on mass-produced Allied Swivel Shoes, eliminating this costly custom machining.

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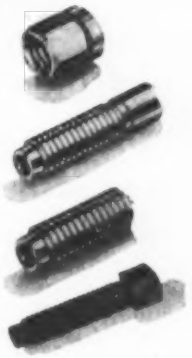

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Bore in Indexing Head	3-15/64 in.
Max. Helix Angle R.H. Worms	90°
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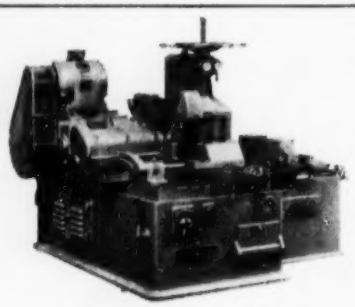

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0	⅜" - SS	⅜" — 1½"	⅛"
1	½" - SS	1" — 2½"	⅛"
2	2 MT	1½" — 3"	⅛"
3	2 MT	2" — 3½"	⅛"
4	4 MT	2½" — 4"	⅛"
5	4 MT	3" — 5"	1"

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BUT HERE we are concerned only with the significance of ABC to you as a reader. For when the advertisers, the advertising agencies, and the publishers founded the Bureau nearly forty years ago to help establish honest circulation figures, they unwittingly set up a cooperative institution that has become a major safeguard for the interests of the reading public.

That is because membership in ABC constitutes one of the strongest guarantees that any publication can offer of its primary devotion to the interests of its readers. And by making that guarantee possible, ABC becomes a major safeguard of the freedom of the press, an objective of exceptional importance in these days when the public is flooded with propaganda from so many sources.

THE SUREST MEANS by which to preserve a free press is to keep it directly answerable to the reading public it would serve. It follows, then, that the survival of a truly free press must depend on its acceptance by that public; and that means in turn that the people must have in their hands some adequate means for holding the publishers responsible to them.

No one has yet devised any means to that end more simple, more direct or more practical than the paid subscription or newsstand purchase price. The right to purchase or refrain from purchasing a publication gives to the readers and to no one else the power to pass judgment on whether that publication should continue to serve the reading public.

TO SUPERVISE this vital process, to check and certify the integrity of the publication's circulation methods and claims, requires a strict and continuing audit of each publication's success in meeting this test of its public acceptance. To that essential function the ABC has contributed mightily by the conscientious performance of its mission. And that is why we are able to have a press supported, for the most part, by advertising revenues, but not controlled as to its circulation or content by any influence other than its readers.

When an advertiser consults the ABC statement of a publication to ascertain the amount, the quality and the trend of its circulation, he does so in the legitimate pursuit of his own interest. But at the same time, inevitably, he is helping the ABC to keep the press responsible and responsive to the reading public. For, in effect, he is asking the publication to demonstrate through its circulation figures that it owes its standing to a voluntary demand by its readers.

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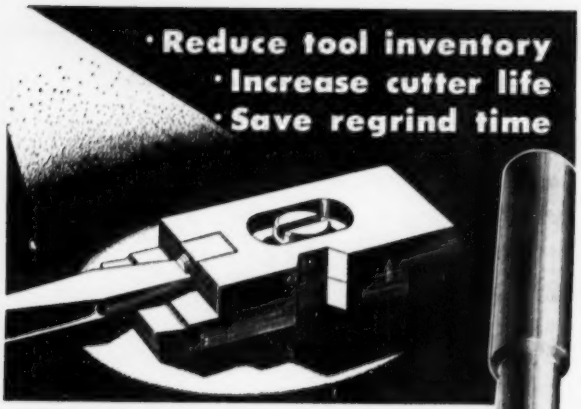

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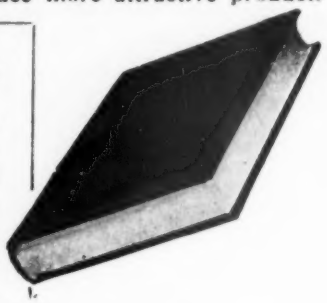

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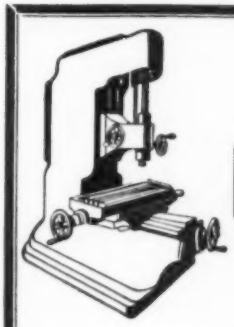

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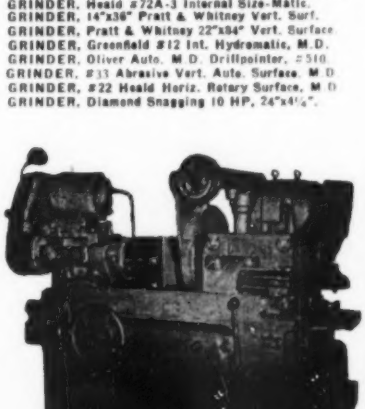

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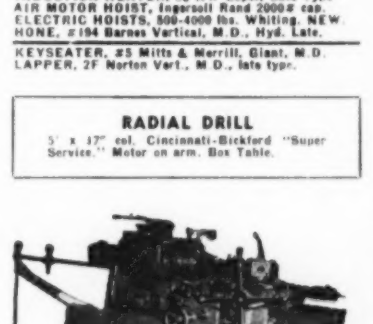

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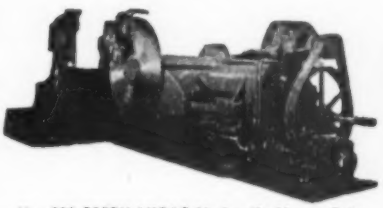

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RIVET SETTER, ⅝" cap. Pneu. Tubular Rivet.
ROLLS, Bertsch Pyramid 18'x1½" cap., M.D., Late
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #26-C Racine Shear Cut 6"x6" cap., M.D.
SAW, Band, Tannewitz GH-36" High Speed, M.D.
SAW, V-26 DoAll Contour Band, Late.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. B.G., Motor driven, H.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, #642 Niagara 42"x½" cap., 15° cap., M.D.
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SHEAR, 10" x 10 ga. Wysong & Miles, M.D., New.
SHEAR, #8E Niagara M.D. 8'x3/16" cap. M.D.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.

TAPPER #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
TRUCK, 2000 lb. Hyster Fork Lift, 9' Model GT-20
TRUCK, 4000 lbs. LT-44 Towmotor Fork Lift 9'.
BRINELL, Tester Machine, Type UK30gM, Steel City.
BRINELL, Tester Machine, Type 63DR, Steel City.

WELDER, 500 amp. Westinghouse Flexors A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Merrien and Acme, M.D.

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AUTOMATICS

5/16" No. 00G Brown & Sharpe
1¼" Conomatic 8 spindle
3¼" & 3¾" Cleveland Mod. A
7½" Baird 6 spdl. chucker
14"x33" & 20"x25" Fay
Gisholt Simplimatics
8" 6 spindle Bullard "A" Multaumatic

BROACHES

5 ton, 40" Foote Burt duplex surface
10 ton, 56", No. 3XA Oilgear
12 ton, No. V2 American vertical
15 ton, 48", No. H10-48 American
18 ton, 42", No. V42 American

DRILLS

21" & 24" Cincinnati
24" Buffalo RPMster
Nos. 217, 310 & 321 Baker
No. 36HÓ Baker, index table
No. B250H Natco, No. 5 taper
3' Dresses Simplex radial
3½' American Sens. radial
12 spindle No. 12 Natco multiple
12 spindle No. 39 Natco rail
12 spindle No. 10 Defiance rail
7 spindle Moline Holehog
30 spindle No. 2 Baush
34 spindle No. A16 Natco
No. 7½H-14 Baker two way

COMPLETE MACHINERY SERVICE

GEAR CUTTERS

Type A & No. 12 Barber Colman
Nos. 1 & 5A Lees Bradner
No. 12H Gould & Eberhardt
16" Cincinnati hobber
24", No. 3 Farwell hobber
No. 130 Cleveland Rigidhubber
72" Schuchardt & Shutte hob
72" Westinghouse hobber
4" Gleason spiral bevel
No. 13 Gleason gear tester
10" Pratt & Whitney gear grinder
8" & 12" Red Ring gear shavers
24"x12" Fiather auto. spur
Cimatool tooth rounders

GRINDERS

4"x12" Landis type H
10"x18" & 10"x36" Norton Semi-Auto
No. 2 Cincinnati centerless
21", No. 6-21-1 Besly opposed disc
22", No. 228 Hanchett opposed disc
23", No. 84 Gardner opposed disc
53", No. 24 Gardner opposed disc
No. 72 Heald Sizematic & Gagematic
Nos. 5, 16A, 16-28 & 24-36 Bryant
No. 42 Van Norman radius
8"x24", No. 78 Wil. & Mor. surface
12" & 16", No. 22 Heald rotary surf.
16"x42" Landis hydraulic crank
No. 2 Brown & Sharpe universal

MONEY BACK GUARANTEE

LATHES, TURRET

1⅛", No. 601DD Oster
2", No. 5W Acme
2½", No. 5 Gisholt
36" Rogers vertical
36" Bullard New Era vertical

MILLERS

No. 2A Sundstrand Electromil
18" & 24" Cincinnati duplex
No. 4-36 Cincinnati Hydromatic
No. 2 Cincinnati plain
No. 3B Milwaukee plain
Nos. 32 & 33 Kempsmith Mfg.
Nos. 4, 6 & CT36 Lees Bradner thread
4", No. M80 Taylor & Fenn spline

MISCELLANEOUS

AIR COMPRESSOR. 1500' Worthington
BORING MILL. 4" D. & H. floor type
BORING MILL. 72" N.B.P. vertical
COMPARATOR. 20" Portman
HONES. Nos. 172 & 2610 Barnes
KEYSEATERS. Nos. 3 & 4 Mitts & Merrill
LAPPER. No. 10U Norton
PLANER. 30"x30"x10' Cincinnati
PLANER. 36"x36"x10' Niles Bement Pond
SHAPER. 24" American Auto-Oiled
SHAPER. 26" Morton draw-cut
SWAGER. No. 154 Etna
SHEAR. 4'x3/16" Bertsch gap
UPSETTER. 3" National air clutch

WRITE FOR LATEST CATALOG

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Bargains & Buys

LATHES

Hendey 14"x30" ctrs Geared Head—Taper attch—Micrometer carriage stop—Motor-in-base

Reed-Prentice 16"x8' Geared Head—Taper attch—Motor-in-base

Porter-McLeod 16"x10' Geared Head—Taper attch—Motor-in-base

Pratt & Whitney 16"x120" Model B Geared Head—Motor-in-base—Attachments

(New) Martin 20"x40" to 120" ctrs Geared Head—Swing over saddle 12"—Equipment per your specifications—MD

Hendey 26"x90" ctrs Geared Head—Taper attch—Pan Bed—MD

Niles 36"x12' ctrs Geared Head—Steady rest—MD

Lodge & Shipley 36"x36' ctrs Geared Head—36 speeds—Taper attch — Power rapid traverse — Steady rest—MD

American 42"x32' ctrs Geared Head—16 speeds—Taper attch—MD

American 52"x17' ctrs Geared Head—Auxiliary quadrant—Face plate—MD

MISCELLANEOUS LATHES

Seneca Falls 17"x40" ctrs. "Speed-Cut"—Spindle speeds 600 to 3600 RPM—MD

Lebland 11" Production Lathe—18" center distance—Swing over shear 13¼"—Preselector head—Power longitudinal feed—MD

Warner & Swasey No. 2A Universal Hollow Hexagon Turret—Arranged for chucking—Misc. tooling—MD

Bardons & Oliver No. 7 Universal Turret—Preselector head—Bar feed—Taper Attch—Threading attch—MD—Late type

Cincinnati-Acme 4½"x17" Universal Turret—Cross sliding turret—Arranged for bar and chucking—MD

Morey No. 2G Ram Type Turret—Cap. 1" x 6"—Bar feed—Late type—MD

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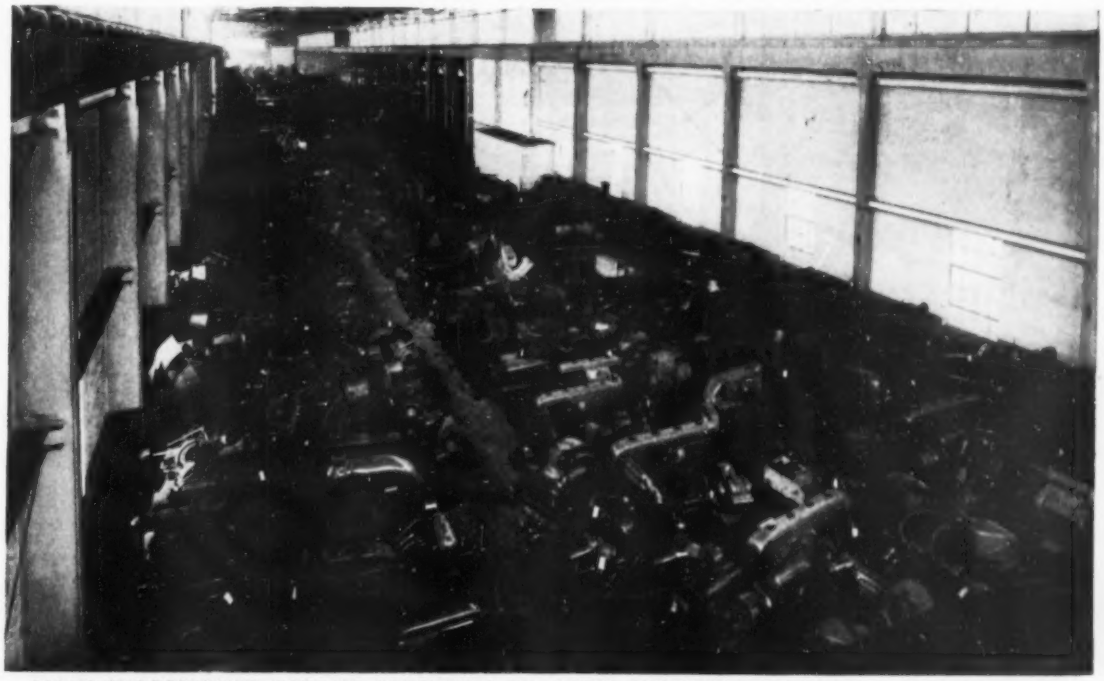

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RAILROAD MACHINERY

#2 Niles-Bement-Pond Double Head Axle Lathe, m.d.
52" Betts Car Wheel Borer
90" Niles Balanced Quartering & Crank Pin Turning Machine, latest
90" Putnam Driving Wheel Lathe, m.d.
90" Niles Journal Lathe, including 2 inside journal turrets and 3½" spindle double quartering attachment, m.d.
90" Niles Driving Wheel lathe, m.d., latest
Niles-Bement-Pond Quartering Machine, m.d., new
300 ton Niles-Bement-Pond Wheel Press, m.d.
500 ton Niles Double End Wheel Press

SAWS

Gustav Wagner Cold Saw, m.d.
7½ H.P. Cincinnati Elec. Tool Co. Abrasive Cut-off Machine, type JCAW
New Heller Hydraulic Cold Saw, Model SSH-960, complete with elec. equip., new
Kolle Heavy Duty Steel & Metal Bandsaw, Model BSM-40, new
6x6" Racine Power Hack Saw, model 2C

SHAPERS

18" Barker Crank Shaper, cone
16" Hercules Shaper, m.d.
22" Hercules Shaper, m.d., new
24" Barker Back Geared Crank Shaper, cone
24" Potter & Johnston, cone
30" Morton Draw-Cut Shaper
32" Cincinnati H.D. Back Geared, cone, motorized
32" Morton Draw-Cut, m.d., late
32" Ohio, m.d.
36" Morton Draw-Cut, m.d., late
36" Ohio Dreadnaught Extra Heavy, m.d.

SLOTTERS

10" Newton, m.d.
10" Newton, cone
12" Bement-Niles, m.d.
15" Canada, m.d.
18" Dill, m.d.
18" Niles-Bement, s.p.d.
18" Pratt & Whitney Vertical, m.d.
18" Betts Crank Slotter, m.d.
20-24" Dill, m.d.
22" Betts, m.d.
48" Niles, m.d.

TAPPERS

3 way Naico Tapper, 8 spindles, fixed center tapping head
No. 1, No. 2, No. 3 Haskins, pneumatic control
2 spindle Haskins, pneumatic control
No. 22 Murchey, 6 to 28 pitch
Baush Radial Drilling & Tapping Machine, m.d., latest
Acme Semi-Automatic Nut Tapper, 6 spindle, 1½", arranged for m.d.

PIPE MACHINES

2" Forbes Type Curtis & Curtis Pipe Machine, m.d.

PRESSES

500 ton double end Niles-Bement-Pond Wheel Press, m.d.
Chambersburg 30 ton Hydro-Pneumatic
Springfield No. 1 Straightening Press
No. 1 Naco OBI Punch Press, m.d., flywheel vee belt, m.d.
No. 4 Verdin, Kappes & Verdin OBI Press, 2½" stroke
Fast Feed OBI Punch Press #190 Bl, 10 ton, 2" stroke
No. 1 Robinson OBI flywheel vee belt, m.d.
No. 51 Femco Punch Press, floor model, vee belt m.d., 1" stroke
100 ton Chambersburg Hydraulic
Niagara OBI Punch Press, flywheel vee belt, m.d., 2½" stroke

PUNCHES & SHEARS

No. 2 Hilles & Jones Horizontal Punch, m.d.
No. 6 Long & Allstatter Single End, m.d.
No. 7 Thomas Vertical, latest
No. 6½ Hilles & Jones Punch & Shear, single end, type G
Cleveland Shear, 72" gap, 18" blade, will shear 1910—1" plate
72" gap Cleveland Plate Punch

PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, 1 head, m.d.
24"x24"x5' G. A. Gray Planer, belted m.d., 1 head on cross rail
24"x24"x6' G. A. Gray Planer, belted m.d., 1 head on cross rail
30"x30"x6' Cincinnati Double Housing, 2 rail heads
30"x30"x10' Cincinnati, belted m.d., 2 heads
36"x36"x10' Betts, belted m.d., 2 heads on rail, 2 side heads
36"x36"x10' Niles, reversing m.d., 2 heads on rail, 1 side head
36"x36"x10' Niles-Bement-Pond belted m.d., 1 head on cross rail
36"x36"x18' Niles-Bement-Pond, 2 heads, variable speed m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36"x36"x24' Cincinnati, belted m.d., 2 heads
42"x42"x14' Niles-Bement-Pond, reversing m.d., 2 rail heads, 1 side head
42"x42"x20' G. A. Gray, 2 heads, belted m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, reversing m.d., 4 heads
48"x48"x30' Cincinnati, 4 heads, belted m.d.
56"x42"x14' Cincinnati, belted m.d., 2 heads
72"x72"x24' Betts, m.d., 2 heads on rail, 2 side heads
72"x72"x36' Niles, 4 heads, reversing m.d.

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, HORIZONTAL AND VERTICAL BORING MILLS, BROACHES, DRILLS, GRINDERS, GEAR MACHINERY, HONING MACHINES, ENGINE LATHES, MANUFACTURING LATHES, MILLING MACHINES, TURRET LATHES, ETC.

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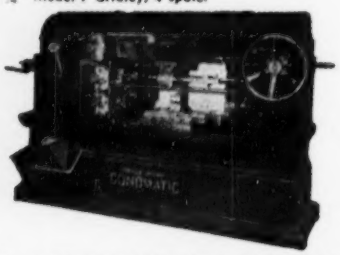
RELIABILITY has been earned by WIGGLESWORTH MACHINE TOOLS

AUTOMATICS

2⅞" Cone 4 spdle., well equipped, 1936
#24 New Britain 4 spdle. chucker, 2½" cap.
¼" Model F Gridley, 4 spdle.



2" 4 SPINDLE CONEMATIC, THREADING SPDLE., TAPPING ATTACHMENT, BAR FEED, CONSIDERABLE TOOLING. EXCELLENT CONDITION. 1943

BORING MILLS

42" Bullard New Era, rail & side head
No. 40 Landis floor type, 4" bar, rebuilt

GRINDERS

#76RA Rogers knife grinder, 76", late
Cinn. Internal, 24" swing, 78" stroke
16x42" Landis Type D Crank Pin
14" Hammond WD carbide tool, late
14x120" Landis plain cylindrical
#104 Rivett Universal, 1942, rebuilt
#4 Bryant Internal, auto. sizing
#70A Heald plain internal, 1940
No. 5 B & S cylindrical, 3x12" late
#33 Excello ext. groove, late type
#86—30" Gardner vert. disc grinder
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
P & W deep hole drill grinder, late
Model 1311 P & W contour, late

DRILLS

#2LMS Leland Gifford 4 spdle., hand feed
6'17" Carlton radial, DC motor, late
#2LMS Leland-Gifford, 26", hydraulic
#2 Allen, 2, 4, 6 spdle., #2 M.T.
Type 14 Natco 12 spindle
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle

GEAR MACHINERY

6" Gleason straight bevel generator
13LS Fellows lapper, late
7A Fellows, shaper high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES

42"x26' ctrs American, High Duty, 16 speeds
30"x10' American geared head, taper att.
42"x25' American Hvy Dty, 2 carriages, late
48"x35' LeBlond Hvy Dty, taper, late
Hepburn Shell lathe, late
Gisholt Simplimatic, platen type, late
33" Niles vertical wheel lathe, 1930
48" Niles vertical wheel lathe, 1930

TURRET LATHES

#1L Gisholt Universal, 3" hole, 1937
Libby type H, 24" swing, 8 spdle. speeds
#4 W & S plain, Timken, #327217
#2 Simmons Microspeed, air chuck, late
#3 Gisholt Universal, late

SHAPERS & PLANERS

30"x30"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone

MILLS

08 Cinn. horiz., auto. cycle, 1943
Briggs production, hydraulic, 12x42" tble.
#1-14 Kent Owens production, late
#1½8 K & T horiz., dble. overarm, rebuilt
10C Van Norman Contour

THREADERS

8x16" Hanson-Whitney Universal, mill, late
6x80" P & W miller, splining & milling
Lees Bradner Model B Cridan, late
#50 Excello Precision grinder, 28x68"
13" Automatic Machinery miller, late
#2 Dalzen grinder, 3" o.d. cap., late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type

FURNACES

Whiting Converter, 2 ton cap., late
Model SP Juthe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES

#12 Zch & Hahnemann precussion, 150 ton
#78½ Bliss straight side, 350 ton, sgle. crank
Ferracute type EG-52 embossing, 150 ton
Lucas 50 ton straightening, 24½" stroke
#57 Toledo, 150 ton, s.s., s.c.
#4 Toledo OBI, 25 ton, 2" stroke

MISCELLANEOUS

TAPPERS: Haskins 2CAM, 5/16", late
Cleve. Model EO, ½", late
BROACH: XL12 Oilgear, 60" stroke
WELDER: 75 KVA Federal spot, PA-1-18
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
SPINNING RIVETER: Grant 5 spdle.
HAMMER: 300# Bradley Upright Helve
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton

T. R. WIGGLESWORTH MACHINERY COMPANY

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LATE MODEL MACHINE TOOLS . .

AUTOMATICS

3⅛" RA-4 Acme Gridley, 1940
2" Model A Cleveland, 1941
1¼" Model A Cleveland, 1943
1-1/16" Model A Cleveland, 1943
No. 00G Brown & Sharpe, 1941

BOREMATICS

No. 49 Heald Single End, 1941

BROACHES

HP-100 La Pointe Horiz. Broach, 1945
5 Ton 36" Stroke La Pointe Vertical, 1942

DRILLS

No. C225H Natco Multi. Spdl. 1942
Ma-6 Avey 4 Spindle, H.F. 1943.
Allen Single Spindle Drill & Tapper, 1942
No. 2 LMS Leland-Gifford, H.F. 1942

GEAR EQUIPMENT

No. 7 Gleason "Revex" Rougher, 1943
No. 6 Gleason Revacycle Generator, 1940
No. 72 Fellows H.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, '42

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type "C", 1942
12"x66" Fitchburg Plain Hyd. 1942
12"x48" Cincinnati Univ. Grinder, 1942
10"x18" Norton Plain Type "C", 1940
6"x30" No. 12 B&S Hydraulic, 1940
No. 5 Brown & Sharpe Plain, 1941
No. 2 Cincinnati Centerless Grinder, 1944

GRINDERS, INTERNAL

No. 72-A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 16 CP 16 Bryant Hydraulic, 1942
No. 16-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic, Gap, 1940
No. 112 Rivett Universal Internal, 1940

GRINDERS, MISCELLANEOUS

Cincinnati Centerless Lapper, 1942.
No. 600 UK Hanchett Face Grinder, 1946.
No. 33 Excello Univ. Thread, 1940.
HRS Barber-Colman, 1942.

GUN BARREL MACHINES

No. ½ B x 50 P & W Reamer, Latest
No. ½ B x 30 P & W Reamer, Latest.
No. ½ B x 50 P & W Rifler, Latest.

LATHES, ENGINE

16"x296" American Geared Head, M.D.
27"x192" Niles Timesaver, 2 Carr. 1941
27"x132" Monarch Auto. Sizing, 1942.
27"x96" Niles Timesaver, 1940
26"x180" Betts Bridgeford, 1940
26"x96" Betts Bridgeford, 1940
10"x20" EE Monarch Toolmakers, 1943

LATHES, PRODUCTION

No. 5D Potter & Johnston Automatic, 1943
8"x84" Lo-Swing Semi-automatic, 1941
Lipe Carbo-Matic Lathe, 1942

LATHES, TURRET

No. 1A Warner & Swasey Saddle Type, 1941
No. 1L Gisholt Universal Saddle Type, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. H5 Libby Universal Saddle Type, 1939
No. 5 Gisholt Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942

MILLS, PRODUCTION

M-18 Milwaukee, 1943
No. 1224 Milwaukee Simplex, 1943
No. 08 Cincinnati Vertical, 1943

MILLS, TOOL ROOM

No. 3 Cincinnati Vertical, M.S. D.T. 1940
No. 3 Van Norman Plain, 1942
No. 2 MI Cincinnati Plain, 1951
No. 21 Van Norman Plain, 1942

SHAPERS

16" Gornetti Universal Shaper, New
20" Gornetti Universal Shaper, New
18" Brosk Universal Shaper, New.
24" Gornetti Universal Shaper, New

PRESSES

650 Ton Verson Dbl. Act. Eccentric, 1940
No. 166 Toledo Toggle Press.

Partial Listing — Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.

1961 S. Meridian St. • • Indianapolis, Indiana

MODERN MACHINES

#9A Jones & Lamson Turret Lathe—new 1941 Serial #65107—Rebuilt and guaranteed
Heald #25A Rotary Surface Grinder—Serial #4577 Reconditioned and guaranteed
3'9" Column Cincinnati Bickford Radial Drill Serial #2A-41—new 1936—Rebuilt & guaranteed
72" Rebuilt King Heavy Duty Vertical Boring and Turning Mill—Serial Lot 38-#175
4½" Bar Giddings & Lewis #45 Table Type Horizontal Boring, Drilling and Milling Machine—Serial #8150.
Ingersoll Adjustable Rail Planer Type Milling Machine—Serial #3158—Reconditioned and guaranteed
#64 Fellows Gear Shaper Ser. #26113
#64A Fellows Gear Shaper—Ser. #25634
Rebuilt 6' 15" Column American Triple Purpose Radial Drill—Serial #55592.
60" Hanchett Face Grinder—Reconditioned and Guaranteed.
6D Potter & Johnston Automatic Chucking Machine Serial #78393
16" Gould & Eberhardt Shaper—Ser. #66737

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FELLOWS Gear Shaper

61-A Purchased New in 1943

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ELECTRIC EQUIPMENT CO.

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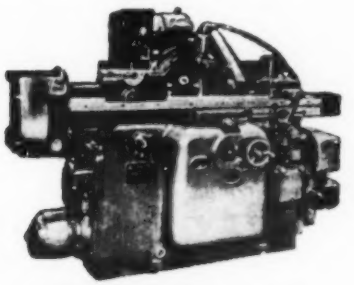
LATHES

MONARCH Model EE 10"x20" Toolroom Lathes
MONARCH Model N G.H. Engine Lathe 33½"x120" cc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' cc
AMERICAN G.H. Engine Lathe 24"-27"x90" cc
AXELSON G.H. 24-Sp. Engine Lathe 16"x54" cc
LEHMANN G.H. 16-Sp. Engine Lathe 18"-20"x82" cc
AMERICAN G.H. Engine Lathe 16"-18½"x30" cc
MONARCH Model 5T Multi-Tool Mfg. Lathe 12"x18" cc
HARDINGE 2nd Operation Lathe 1" Cap.



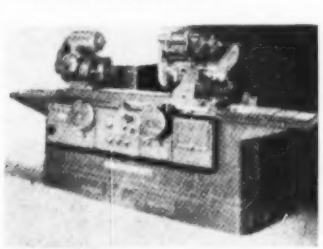
JONES & LAMSON MODEL TG 12 x 45"
AUTOMATIC THREAD GRINDER

TURRET LATHES

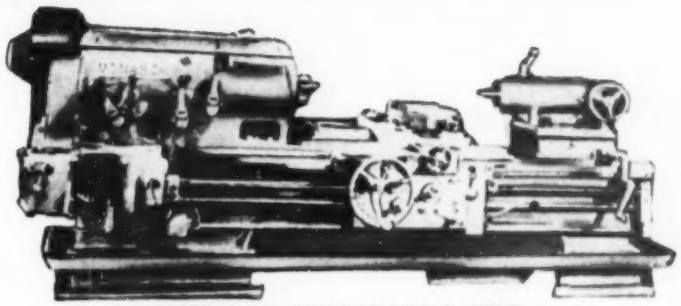
WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod. 2 G.H. Ram Type 1½" Cap.
BARDONS & OLIVER Mod. 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1½" Cap
GISHOLT Mod 3 G.H. Ram Type 1½" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2½" Cap.
GISHOLT Mod 5 G.H. Ram Type 2½" Cap.
FOSTER Mod 18 Univ. G.H. Saddle Type 2-9 1/16" Cap

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Uni. Hydr. Cyl. Int.-Ext. Grinder 12"x 36" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x45" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 31 Thread Grinder



CINCINNATI 12" x 36" HYDRAULIC UNIVERSAL GRINDING MACHINE INT. EXT.



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

LAPPING MACHINES

ULTRALAP Model 10 Vert. Lapper

TAPPING MACHINES

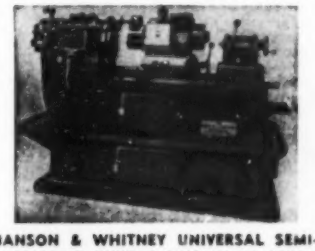
BAKEWELL Model 2 Tapper ⅜"—2½" Cap

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
MILWAUKEE No. 1-B Universal Miller
BROWN & SHARPE Mod 10 Auto. Production Miller
CINCINNATI Mod 08 Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1804 Thread Miller 4½"x36"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"



HANSON & WHITNEY UNIVERSAL SEMI-AUTOMATIC THREAD MILLING MACHINE
10" x 48"

MISCELANEOUS

FAMCO #6, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #6, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLER

GORTON Model 8D Super Speed Vertical Miller

PRESSES

WIEDEMANN Model R11P 18 Sta. Power Turret Punch
RUESCH #2 Percussion Press
POWER PRESSES (New)

AUTOMATICS

BROWN & SHARPE Model 00G ⅜" Cap.
CLEVELAND Model A Single Spindle 9-16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1½"—18" Cap

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table

DRILLS

NEW O. M. S. R. Type T B 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x5½"
NEW CANEDY OTTO 18" Single Spindle ⅞" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 15" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 3'x9" Column
LELAND GIFFORD 2 Spindle 20" Drill Press

GEAR EQUIPMENT

BARBER-COLMAN Type S Gear Hobber
FELLOWS 3" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Rougher
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model 6 Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap

PROFILERS

PRATT & WHITNEY 40-Inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

HENDEY Universal H.S. Crank Shaper 12"
GOULD & EBERHARDT Industrial Shaper 20"

SHEARS

COLUMBIA 92"x¼" Cap. 18" Gap Power Shear
PEXTO 44" Geared Power Gap Shear
NIAGARA Model 412 Power Shear 12'x16 Gauge

NIAGARA #412 POWER SQUARING SHEAR
12' x 16 GAUGE

MACHINERY RENTALS, INC.
197-199 MOTT STREET NEW YORK 12, N.Y.
PHONE: WORTH 4-7615

UNUSUAL BUYS WITH GUARANTEED PERFORMANCE

PARTIAL LIST OF LATHES

Lodge & Shipley 14"x5' G.H., single pulley drive. 12 spindle speeds, 20" centers.
American 24"x8' G.H., 12 spindle speeds.
American 30"x12', 3 SCD, 6' centers.
American 30"x14' G.H., 12 spindle speeds.
American 36"x40' bed, Internal Face Plate Drive. 33" centers, 2⅝" hole in spindle.
Lodge & Shipley 16"x126" centers G.H., Timken bearing, drop lever handles in apron, lat. type.
Bradford 20" x18' bed, 4 SCD, 12' centers.
LeBlond 17"8' bed 3 SCD.
American 16"x8' bed, 3 SCD, bowl head.
Lodge & Shipley 16"x6', single pulley.
LeBlond 15"x8' G.H., 9 spindle speeds.
Lodge & Shipley 14"x6', 3 SCD.
American 14"x6', 3 SCD bowl head.
LeBlond 27"x10', 3 SCD Lathe, 3'11" centers.
American 24"x18' Lathe, vee-belt drive, 13' centers, 12 spindle speeds.
Boye & Emmes 20"x10', G.H., complete with taper attachment.
Greaves Klusman 22"x8' G.H. Lathe, complete with taper attachment.

TURRET LATHES

Acme #2 Full Universal, single pulley drive, hole thru spindle 3½".
Gisholt 1-L Saddle Type Turret Lathe, with bar feed, late type.
Oster 601 Rapiduction.
Warner & Swasey 2A, single pulley drive.

BORING MILLS—Vertical

Bullard 42", 4 jaw chuck table, late type.
Niles 36"-44", 1 rail and 1 side head.
Niles 42"-50" Driving Box Borer, Burnisher and Facer, motor driven, late type.
King 42", motorized, 2 heads on rail.
42-50 Niles Vertical Boring Mill, one rail and one side head, late.

GEAR MACHINERY

Gould & Eberhardt 18-H Hobber.
Gould & Eberhardt 96H Gear Hobber.
Gould & Eberhardt 60BM Gear Rougher.
Fellows 612 Sour Gear Shaper.
Fellows 725 Gear Shaper, with spur guide.

GRINDERS—Cutter & Tool

Oliver Template Tool Bit Grinder, late.
Sellers 4T Tool Grinder, late type.
Sellers 6T Tool Grinder, late type.

GRINDERS—Internal

Heald 78 Centerless, Internal & Cylindrical, late type.
Heald #50, tight & loose pulley.
Heald #70A, new 1941.
Heald 72A3 Plain Internal Grinder, late type.

GRINDERS—Cylindrical

Landis 26"x168" centers Plain, arranged for motor drive with motors, 10 speeds 3 to 62.
Landis #2 Universal, 12"x35"centers, belt drive.
Landis 16"x72" Plain Cylindrical.

GRINDERS—Thread

Jones & Lamson 8x31, late type.

MILLERS—Plain

Cincinnati #4, single pulley drive.
Brown & Sharpe #3, 4 SCD.
Douglas #0, rectangular overarm.

MILLERS—Vertical

Brown & Sharpe #3, single pulley drive.
Cincinnati #3, Single pulley drive.
Kearney & Trecker #4, motor in base, stationary head.

DRILLS—Radial

American 5'14" column, Triple Purpose.
American 3'10" column Triple Purpose, gear box on base, 12 speeds.
Cincinnati Bickford 4'11" column, gear box on base.
Cincinnati-Bickford 3½', #4 Morse taper.
Fosdick 6'15", Heavy Duty Radial Drill.

PLANERS

Cincinnati 36x36x18', Double Housing.
Pond 48x48x16' Double Housing, DC drive, 4 heads.
Pond 84x84x16' Double Housing, DC drive, 4 heads.

SHAPERS

Smith & Mills 14" Plain Crank, Lima drive.
Gould & Eberhardt 20", B.G., gear box.
Ave.beck 21" B.G., 4 SCD.
Potter & Johnson 24" Universal.
Gould & Eberhardt 24" B.G., gear box.
Smith & Mills 25" B.G., 4 SCD.
Columbia 28" B.G., gear box drive.
Gould & Eberhardt 28" B.G., gear box.
Gould & Eberhardt 32" B.G., gear box.

BOREMATIC

Heald #42, late type.

MISCELLANEOUS MACHINERY

Fitchburg 48" Spline Grinder, late type.
H&G Model 1-K Threading Machine, late.
Taft Pierce Bench Center, 8"x48" centers.
Hoffman Heavy Duty Portable Cleaner.
Model #22 Rodgers Hand Track Press.
Lincoln Idealarc 150 Amp Welder, late type.
Hobart 200 Amp Arc Welder, late type.

GUARANTEED MACHINERY

Cincinnati Machinery Co., Inc.
219 East Second Street
Cincinnati 2, Ohio

AIR COMPRESSOR, 64 C.F. 1-R Model ER-1, Late
AUTOMATIC, 1¾" 4 spin. Gridley Model G
BOLT THREADER, 1½" Williams Reliance
BORING MILL, 100" N.B.P., 2 Hds., M.D.
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 72" N.B.P., 2 Hds., P.R.T., M.D.
BORING MILL, 4½" bar G. & L. No. 45, Tble.
BORING MILL, 3½" bar Giddings & Lewis #8
BORING MILL, 3" bar Lucas, Table Type
BORING MILL, 48" Colburn, 2 Hds., M.D.
BORING MILL, 4½" Bar Niles, Table Type
BORING MILL, 3¼" Bar Binsse, Knee Type, M.D.
DRILLS, RADIAL, 4' Western, M.D. (2)
6' Amer. 15" col. Trip. Purp., M-on-Arm
5' Amer., 15" col. Trip. Purp., M-on-Arm
5' Amer., 14" col., Trip. Purp.
5' Niles #10 Rightline, Univ., Motor-on-arm
4' Amer., 13" col. M-on-Arm
3'8" & 2½' Arboga (Swedish), Late
TABLES, RADIAL, 36"x20"x20"
DRILLS, #8D Colburn 36", 5" capty.
#314 Baker, 24", 3" capty.
24" Cinci. Bick., Tapping, M.D.
#2LMS Leland Gifford, Deep Hole
DRILL, MULTI, 32 spin. W-7 Baush, 1947
FLANGERS, ¾" and ½" McCabe (2)
GEAR CUTTERS, No. 13 B. & S. Spur & Bevel
GEAR SHAPERS, Nos. 6, 6IA, 64 & 64A Fellows Nos. 7S & M6I Fellows (2)
GRINDER, SURFACE, 14"x36" P. & W.
GRINDERS, SURFACE, No. 33 Abrasive, Vert. Spin.
GRINDER, 4"x18" Landis #4H, Cylindrical, Late
GRINDER, No. 6T Sellers Tool, 1942
GRINDER, Micro Internal, large capty.
GRINDER, 18"x144" Norton Cyl., M.D.
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATER, No. 3½ Baker, 24" str. x 4" wide
LATHES, 48"x20' cen. N.B.P., M.D.
48"x20' bed, Amer. T.A., Grd. Hd.
32"x14' bed Schumacher Boye T.A., M.D.
28",48"x16' bed Rann Larmon, Gap
26/48"x18' McCabe, Dble. Spin.
26"x12' Bridgeford, QCG Grd. Hd., M.D. (2)
24"x12' bed B. & L., T.A., Grd. Hd.
24"x8' Reg Amer., T.A., M.D.
20"x78" Matra, T.A., New
20"x10' bed Amer. Grd. Hd. M.D.
20"x10' bed L. & S., T.A., M-in-Base
18"x10' bed L. & S., T.A., Cone Motorized
18"x8' bet L. & S. Selective Grd. Hd., M.D.
16-x60" cen. P. & W. Motor-in-Base
16"x12"x8' Harrington Gap M.D.
16"x6' & 12"x6' Headeys (2)
14"x6' bed Amer. T.A., M-in-Base
10"x56" bed Sheldon, New 1946
No. 3x42' Hendey Turning (1200 r.p.m.)
TURRET LATHES, No. 3AL Gisholt, 6¼" H.S.
No. 3 Gisholt, 1942
No. 2B Foster Univ., 3¼" Capty., Bar Timken
No. 1B Foster Univ., 2" capty. M.D.
21" Acme Universal Brass, Late
18" Libby Model A Grd. Hd.
MILLER, No. 22L Van Norman, Late
MILLER, No. 3 Cinci. Hi Power, Motorized
MILLERS, Nos. 2 & 3 Cinci. Hi Power Univ., M.D.
MILLER, No. 2 Stand. K. & T. Univ. #50
MILLER, No. 2 Van Norman Ram, M.D.
MILLERS, No. 2 Abene (like Van Norman) New
MILLER, No. 1½B K. & T. Univ., Grd. Hd.
MILLER, No. 000 B. & S. Plain, M.D., Late
MILLER, No. 0 Sundstrand Rigidmit, Hand
THREAD MILLER, 12"x60" Morey Shields, '42
PRESS, 73½ Bliss S.S., 6" stroke
PRESS, No. 55 Toledo S.S., Grd., 171 ton capty.
PRESS, #3C Bliss 30", "Stiles", Late
SQUARING SHEAR, 8'x3/16" Geo. Ohl

BENNETT MACHINERY CO
375 Allwood Road, Clifton, N. J.
Off Route 5-3, Phone Prescott 9-8996
New York Phone: LOngacre 3-1222

PRACTICALLY NEW
LINDBERG 8 KW ELECTRIC FURNACE

Serial No. 7711, Model 1014-E15, 1 Phase, 60 Cycle, 54 Volts, 2500° F. Complete with Motor, Blower, Controls Brand New 8 KVA LINDBERG Transformer, 1/60/440 to 54 Volts.

WINSTON MACHINERY COMPANY, INC.
326 West Ohio St. Indianapolis 2, Ind.

BROWN & SHARPE Automatics (several)
#12 Martin Hydraulic Marking Machine
BAIRD Cut & Carry Drawing Press
4" RICE BARTON SPLINE MILLER
DIAL FEED POWER PRESSES
SHELL THREAD ROLLERS
30" ESPEN-LUCAS Hydraulic Cold Saw
¼" MANVILLE #1 D.S.S.D. Header
#40 ANDERSON Dial Feed Tappers
#2A WARNER & SWASEY Turret Lathe

Our New Address Is:

CURRIER MACHINE SALES
1124 Dixwell Ave., P. O. Box 333
Hamden, Conn.

Brand — New
Centering Machines
double-end — Model CM
swing 10" center distance 42"
2 motors 220/440/60/3—Pump
No priority necessary
Immediate delivery from stock

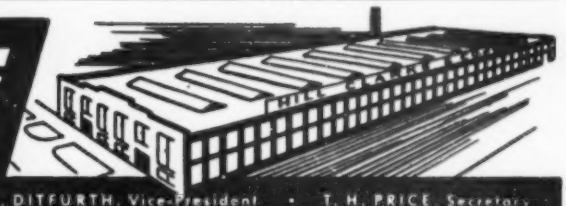
MACHINE & TOOL CO.
29-28 41st Ave Long Island City 1, N.Y.

MACHINE TOOLS

GEAR EQUIPMENT
FELLOWS No. 3
FACE GEAR CUTTER
FELLOWS 2T THREAD GENERATOR
FELLOWS No. 7 GEAR SHAPER

LINCOLN MACHINERY
433 N. LARAMIE AVE. CHICAGO 44, ILL.

HILL-CLARKE MACHINERY COMPANY



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Customers Confirm—
You're Always Sure With
HILL-CLARKE

THE MAYTAG COMPANY REPORTS TWO-THIRDS GREATER PRODUCTION, easier operation and less maintenance, required with this Hill-Clarke rebuilt lathe. For 38 years MAYTAG has relied on Hill-Clarke for good, dependable used machines like this recess lathe used to center bottom of washer tub so that agitator has same all around bottom clearance.

MILLING MACHINES

54"x30"x16' Ingersoll Slab Mill
4"x9" Hanson-Whitney Thrd.
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 hds.
42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
14'x¾" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

FULL MONEY-BACK GUARANTEE

1. **Hill-Clarke gives you an unconditional money-back guarantee.**
2. **All machines in stock.**
3. **You can see your machine run and tested under power in our plant before purchasing.**
4. **Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.**
5. **A responsible organization — with 85 years' experience.**

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 3 Avey
D-31 Fox Multiple Drill, No. 2 Taper
6' Western Radial

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

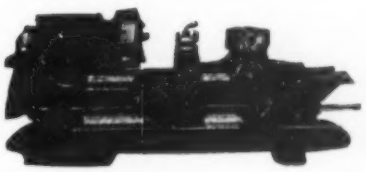
LATHES

12"x21" Fay Automatic
16"x33" R-14 Seneca Falls Auto-Lathe
13¼"x39" Centers Dimco Lathe (New)
15"x39" Centers Dimco Lathe (New)
18"x59" Centers Dimco Lathe (New)
23"x60" Centers Dimco Lathe (New)
24"x39" Centers Dimco Lathe (New)
19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x60" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
No. 22—12" Heald Rot. Gdr. (1944)
5H Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

FEATURE OF THE MONTH



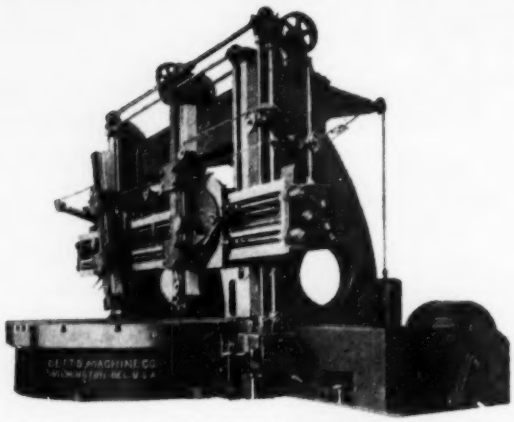
THIS
No. 3 A L GISHOLT TURRET LATHE

27" Swing—6¼" Hole Thru Spindle—
5'-4" Between Spindle and Turret

☛ **CONSULT US ABOUT REBUILDING your own MACHINERY. We rebuild customer-owned tools. 50 years experience.**

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. • PHONE CEntral 6-0500

BORING MILLS-Vertical



BETTS (CONSOLIDATED) 120" Vertical Boring and Turning Mill. POWER RAPID TRAVERSE—Adjustable cross rail with 2 swivel heads; geared feed; motor drive. Dia. of table—108". Maximum swing—122". Maximum distance under cross rail—90". Face of cross rail—24". Face of column—10".

STOCK DELIVERY

BULLARD 8", 16" type A Mult-au-matic; 6-spindle; M.D.

COLBURN 72"—2 swivel hds; PRT; M.D.

NILES 53" hvy pattern; 2 swivel hds; M.D.

NILES-BEMENT-POND 100"; 2 swivel heads; P.R.T.; M.D.

NILES-BEMENT-POND 120"; 2 swivel heads; P.R.T.; M.D. (heavy)

WRITE—WIRE OR PHONE FOR DETAILS

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MOREY ...for machine tools!

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410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

LATHES

12"x30" MONARCH Model C Toolroom Lathes
14"x54" REED PRENTICE Geared Head Engine Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, 1941
20"x10' LODGE & SHIPLEY Selective Geared Head
30"x16' bed AMERICAN High Duty Geared Head
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe

GRINDERS

No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—1942
No. 104 RIVETT Internal Grinder
No. 172 HEALD Internal Grinder

AUTO LATHES & TURRETS

No. 918S RIVETT Handscrew Machines
No. 2 B&S Wire Feed Hand Screw Machine
No. 2 B&O Geared Elec. Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1942
Nos. 4D & 6S P&J Auto. Lathes

MILLERS

No. 0-8 CINCINNATI Plain Milling Machines
No. 0-8 CINCINATI (Model OT) Vert. Milling Machine
No. 1-8 KENT OWENS M.D. Production Miller
No. 1-14 KENT OWENS M.D. Production Miller
No. 1-18 CINCINNATI Plain Mfg. Miller
Model MM-5 U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2M CINCINNATI Vertical Miller, 1941
18" CINCINNATI Mfg. Knee Type Milling Machines
No. 3E VAN NORMAN Plain Ram Type Miller
4½"x36" P&W Model C Thread Miller
6"x60" P&W Model C Thread Miller
36"x36"x16' INGERSOLL Planer Type Milling Machine—3 heads
36"x36"x12' INGERSOLL Planer Type Milling Machine—3 heads—late

GEAR EQUIPMENT

Type A BARBER-COLMAN Gear Hobber
No. 64 FELLOWS Gear Shaper
No. 72 FELLOWS High Speed Gear Shaper
No. 725A FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher

BORING MILLS

No. 6 GIDDINGS & LEWIS Horizontal Boring, Drilling & Milling Machine
No. 32 LUCAS Horizontal Boring, Drilling and Milling Machine
100" BETTS Vertical Boring Mill, 2 heads

WIGGLESWORTH INDUSTRIAL CORP.

203 BENT ST., CAMBRIDGE 41, MASS.-KIRKLAND 7-5242

FAIR DEALING PRICES FROM FAIRFIELD

A DEALER OF ESTABLISHED REPUTATION

Three Unusual Tools — All Late

Cleveland 6 Spindle AUTOMATIC CHUCKER, 4¾" cap.

#145 Cleveland RIGIDHOBBER.

#81 Heald INTERNAL CENTERLESS GRINDER.

FAIRFIELD EQUIPMENT Company DEALERS IN USED REBUILT & NEW MACHINERY

75 SANFORD STREET at R.R. Station Phone FAIRFIELD 9-3321 FAIRFIELD, CONN.

MACHINE TOOLS

LATE TYPE CLEVELAND 2½" Model A
Single Spindle Automatic

Reed Prentice 16" x 54" Engine Lathe—Late Model

WRITE TODAY

LINCOLN MACHINERY
423 N. LARAMIE AVE. CHICAGO 44, ILL.

NEARLY NEW (1948)

GLEASON #7 HYPOID CUTTER SHARPENER. Ser. #24768. Hand Index, Hand Feed. Coolant.

W. C. COWDEN MACHINERY CO.
1207 W. Genesee St., Syracuse 4, N. Y.
Phone 37787

HENDEY 14 x 54 LATHE
Late Type — 1943
Complete with Collets, Taper Attachment, Etc.
EXCELLENT CONDITION
WINSTON MACHINERY COMPANY, INC.
326 W. Ohio St. Indianapolis 2, Ind.

No. 5-B SYKES (Farrel) GEAR GENERATOR New 1945, cap. 1 to 61" dia., 18" face.
16" BULLARD MULT-AU-MATIC, 8 spindle Type D, new 1940.
BRANDT MACHINERY COMPANY
514 Empire Building, Pittsburgh 22, Pa.

MACHINERY FOR SALE
ATTENTION EXPORTERS

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, 216 D. E. Whiton Machine. Write for full information.

FS-1833, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
CINCINNATI-BICKFORD: 1¼" upright
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine
SUNDSTRAND: 44" Double End Centering Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

JIG BORING MACHINES

PRATT & WHITNEY #1 Jig Borer
SWISS #5B Jig Borer
LINDNER #14 & #15 Jig Borer, new

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
REINECKER Relieving Lathe (new)
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic. 25½" swing x 27" centers
POTTER & JOHNSTON: #6 DREL Automatic
PROGRESS: Geared head 16" to 30" swing (New)
VDE New Engine Lathe 49" swing x 20' centers
VDE New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16-J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
SUNDSTRAND: 44" Double End Centering Machine
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HEADLINERS

MILLING MACHINES
No. 1-14 Kent-Owens Hydraulic, late
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
48" Cincinnati Plain Automatic

LATHES
22"x74" ctrs. Lodge & Shipley Selec. Grd. Hd., taper
12"x84" centers American 12-speed Grd. Hd., taper
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
21"x136" ctrs LeBlond Hvy. Dty., Turner Drive, taper
24"x60" ctrs American Hvy. Pat. 12-speed Grd. Hd., taper
36"x96" centers Boye & Emmes, cone, taper
36"x120" centers American 12-speed Grd. Hd., taper

PLANERS
30"x30"x8' Cincinnati, a.c. m.d.
3"x36"x10' Cincinnati, a.c. m.d.
42"x42"x16' Gray
42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads

GRINDERS
No. 81 Heald Internal
No. 2 Brown & Sharpe Surface
10"x24" Landis Plain Self-cont., m.d.
10"x18" Norton Plain, m.d.
No. 49—53" Besly Vert. Spdle. Surface, m.d.
No. 2 Norton Motor Driven Universal Tool & Cutter

GEAR MACHINERY
No. 1 Whiton Spur & Bevel
#3-36 Brown & Sharpe, A.C. M.D.
No. 2 Barber-Colman Hobber, m.d.
No. 5A Cincinnati 60"x16" Cutter
No. 12 Barber-Colman Hobber, m.d.
No. 18HM Gould & Eberhardt Double Spindle Hobber, s.p.d.
No. 18-H Gould & Eberhardt Hobber, a.c. m.d.
6", 11" & 18" Gleason Bevel Gear Generators
18" Gleason Bevel Gear Tester
No. 7 Fellows High Speed Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

RADIAL DRILLS
6'-16" col. American "Triple Purpose", m.d.
7'-17" col. Dreses, m.d.

PUNCH PRESSES
No. 2 VKV, O.B.I.
No. A4 Robinson O.B.I., m.d., 56-tons
No 77 Toledo Open Back, b.d.
No. 5H Cleveland Horning, arr. m.d.

MISCELLANEOUS
10' x 10 ga. Niagara Power Squaring Shear
6" Cox Pipe Machine, m.d.
7"x7" Peerless "Mechani-Cut" Hack Saw, late
10" Dill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
No. 14½ W&W Punch & Shear
Class F Bertsch Punch & Shear
1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

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3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

TIME TO REBUILD YOUR OLD MACHINE

Yes, the time to rebuild your old equipment is now. The place to have it done is the Worcester Automatic Rebuilding Company. We have skilled workmen and eningeers who specialize in rebuilding old machines - make them new again to meet exactly the needs to do a particular job . . . and do it right. The entire job from start to finish is tailor-made to solve your production problems.

Now, if you want to rebuild your old equipment and have it the way you want it and delivered when you need it -- then see us. All our *engineered* rebuilt machines will add up to time-saving, money-saving performance every time.

We take your old machine, strip it down to the bare casting — clean it — replace worn parts and refinish sliding surfaces like new again. All machines are carefully tested and guaranteed.

Let us handle your Machine Tool Rebuilding and Motorizing Problems. We will be glad to quote phase 1 & 2. Every inquiry is handled competently and promptly. Simply write to address below.

WORCESTER AUTOMATIC REBUILDING COMPANY

91 WEBSTER STREET, WORCESTER 3, MASS.

Precision Machine Tool Rebuilding • Motor Drive Engineering

NEW AND USED

2—Potter & Johnston auto. Turret Lathes Model 6-DREL
2—Herbert Universal Turret Lathes #9S #4
2—Bardons & Oliver Turret Lathes #7 #5
3—Cincinnati Vert. Mills #0-8
2—Girards Radial Drills 3 ft. 4 ft.
2—Double end Centering Machines 10x42
1—Jones & Lamson auto. Thread Grinder 5/16
1—Landis Hydr. Internal Grinder 15x8
1—Heald hydr. Surface Grinder 22
1—Arter Surface Grinder A-1-8
1—Logan hydr. Press, cap. 5 ton
2—Hi-speed V-Ram Shaper 20"

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GARDNER HORIZONTAL DISC GRINDER
Model #179, 72" Segment Type Wheel
Complete with Motor, Electrical Equipment and Wheel Dresser
Excellent Condition
WINSTON MACHINERY CO., INC.
326 West Ohio St. Indianapolis 2, Ind.

No. 2 B & S High Speed Automatics, M.D.
30" P & W 2-spindle Vertical Profiler.
No. 4S Fellows Helical Gear Sharpener.
Nos. 7 & 12 Gleason Cutter & Tool Sharpeners.

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Cap.
King 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mills

DRILLS AND RADIALS

Brand New Radials
American 6'x15" Universal
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS

NEW VERTICAL MILL

ENGRAVERS

Gorton #1A, ME, 1D Deckel G1, GK2, 90.
Preis—UE3—2 dimensional
Taylor-Hobson 3 dimensional Pantograph
T.M.A.—G2 2 Dim.

GEAR EQUIPMENT

Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

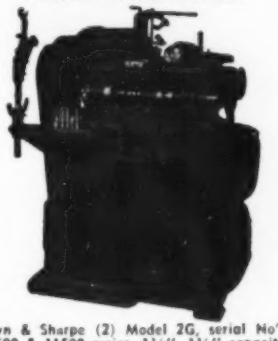
GRINDERS, MISCELLANEOUS

B&S #2 Universal 14"x28"
Brown & Sharpe #5, 3"x18" Cylindrical
Bryant #5. Internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ. 10x30
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl
Norton 10"x18" Type C cylindrical
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 30"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 69 Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaperite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

AUTOMATIC SCREW MACHINES



Brown & Sharpe (2) Model 2G, serial No's. 8500 & 11500 series, 1¼", 1½" capacity
Brown & Sharpe (10) Model 0G, serial No's 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's 14, 15, 1600 series, ⅜" capacity.
Ceco Screw Machine ¾" capacity.
Cleveland, Model AA-11, Serial #36586
Cleveland, Model B, Serial #42618 843 1-1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1⅛"
Conomatic 8 spindle, serial No. 3947VB 1⅜"
New Britain Gridley 61 6 Spindle, Serial No 25410, 1⅝" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hydraulic Vertical
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Thompson Hyd. 8"x24" Hor., Spindle
Taft Pierce #1 Precision

LATHES

American 14"x30", Bridgeford 36"x20', 32"x16'
Gisholt Simplimatic 18"x16½", 2 Tables
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 13x42", 17", 11½" Spindle
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, #3 Duomatics
Pratt & Whitney 16"x60—Late
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24", South Bend 9"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain. Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-B, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd
Milwaukee 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati 4 Spindle Vertical—Profile
Cincinnati 2 Spindle Hydromatic
Cincinnati (2)—1-1B Plain Automatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp
Van Norman #12

PRESSES

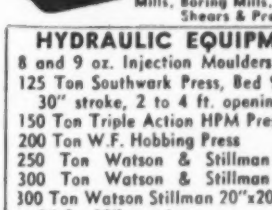
Bliss No. 1 Double Action Drawing Press
Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam 12
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss S-48 Obl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herring, 15 Ton
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Press, type R, Late
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #1
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic, 18"x15½"
Gisholt 4R—9¼" hole in spindle
Libby 1HS with threading att'—3R, 4R
Morey #2G Late
Otter 601 WD #2 Simmons Microspeed
Warner & Swasey #1, #1A, 2, #4

MISCELLANEOUS

Band Saw: New, Kalamazoo
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LaPointe Hydro. Horiz. New Klink, 6 Ton, Horizontal, 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4, MC1H
Keyseater Davis, Baker
Oil Groover: WICACO
Planer: Niles-Bement-Pond 36x36'x10'
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13"
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Cinn. 20, 24", Columbia 36"
Shears Power: Ohl 10' 3/16", 10" x 16 gauge
Vertical Milling Att. New, Bridgefield
Tapper: Haskins—2CA, Bakewell #2
Welder 50 KVA Eisler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave



New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
200 Ton W.F. Hobbing Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.

Send us your Hydraulic problems.

MONA

AARON MACHINERY CO., Inc.

This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.
"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

LAKE IS GEARED TO INDUSTRY'S MACHINE TOOL N-E-E-D-S

AUTOMATIC SCREW MACHINES

#2 Brown & Sharpe Automatic (15) Ser. #4000 to 8000
#0 Brown & Sharpe Automatic (10) Ser. #4000 to 8000
#0G Brown & Sharpe Automatic (4) Ser. #8000 to 11,000
#00 Brown & Sharpe Automatic Turret Formers (7) Ser. # up to 11,000
Greenlee Automatic 4 spindle 1" capacity
#6 Brown & Sharpe Automatic Screw Machine
1 1/16-1⅛ Cleveland Model A Automatic Screw Machine

DRILLS

#2 Avey—3 spindle type MA6
3'-7" Royal Radial Drills NEW (2)
16" Royal Floor Drills NEW (5)
16" Royal Bench Drills New (5)
6'x13½" Cincinnati Bickford Radial U.S. Vari drive
25" Sibley Stub Column 3" capacity

GRINDERS

#1 Norton Universal T & C Grinder
#13 Brown & Sharpe T & C Grinder (2)
#1½ Grand Rapids T & C Grinder (2)

LATHES

Cincinnati Model LT for quick delivery NEW (Chicago Territory)
24"x120"x14' bed (2)
24"x72"x10' bed (1)
18"x96"x12' bed (1)
Ryerson-Convadson 25"x108"x14' bed (1929)

MILLS

#1 Milwaukee with TREE Vertical head
#1½ Brown & Sharpe Universal with Tree Vertical head

PUNCH PRESSES

#5 Bliss Solid Back (2)
#3½ Bliss Solid Back Stiles type (1)
#21 Bliss O B I, (3)
#19 Bliss O B I, (4)
#6B32 Verson 150T
#95½ Toledo 250T
#5 Verson O B Steel Frame

TURRET LATHES

2G Morey Turret Lathes (3)
3L Gisholt Cross sliding turret
1F Foster Fastermatic Turret Lathe
#2 Brown & Sharpe Wire Feed (3)
#1 Brown & Sharpe Wire Feed
#0 Brown & Sharpe Wire Feed (2)

MISCELLANEOUS

6" Jones Vertical Slotter M.D.—1940
2 to 5 HP Buffers (11)
#0 LaPointe Horizontal Broach
XA3 Oilgear Hydraulic Broach
#V-18 American Vertical Broach
Semi Automatic Nut Forming Machine
Niagara #180 Combination Machine
Bliss #112 Rotary Trimmer
Yoder G. 36 Rotary Gang Slitter
#354 Niagara Roll Forming Machine

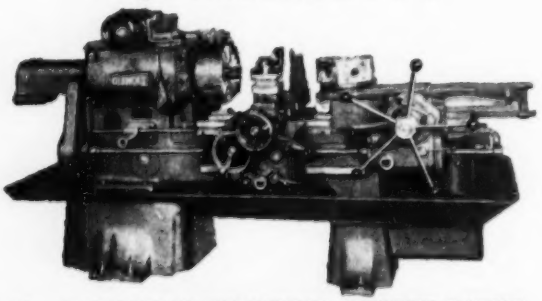
★ EXCLUSIVE DISTRIBUTORS FOR CINCINNATI LATHE & TOOL CO., FOR THE 7 COUNTIES OF CHICAGOLAND.

★ SERVING THE INDUSTRY SINCE 1920.

MACHINE TOOLS

TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

4½" CAPACITY



No. 3 GISHOLT UNIVERSAL TURRET LATHE

Preselector Head
Bar Feed and Chuck
Threading Attachment
Very well tooled

ALEXANDER & FIDEN MACHINERY CO., INC.
1014 GENESEE ST. BUFFALO 11, N. Y.

MONA MEMBER

NATCO HEAVY DUTY DRILL PRESS

No. B225H
Excellent condition; Late
LATE TYPE MACHINE TOOLS IN STOCK
SEND US YOUR REQUIREMENTS

1311 St. Clair Ave.
Cleveland, Ohio
SUPERIOR 1-5100

Wade-Presdee, Inc.

WESTINGHOUSE ENDOGAS GENERATOR

Serial No. 10049-233. Practically New
Capacity 1800 Cubic Feet
Complete with Tank, Permutit, Ranarex Controls and Specific Gravity Meter

WINSTON MACHINERY COMPANY, INC.
326 West Ohio St. Indianapolis 2, Ind.

LATE MODEL TOOLS

American Type T-8-32 Broaches Three-way vertical hydraulic, single ram, 18"x18" table. Cap. 12,000#. MD with 7½ HP motor. 1942.
Barrett 1 ton Portable Shop Elevator Hinged type. Never used. Half price.
No. 320 "Barnesdrill" Multiple Cyl. Hyd. Hone, throat—16¼", spindle stroke 2" to 20", 5" dia. spindle. Sleeves with #4 taper. 1948.

RAVINE, INC
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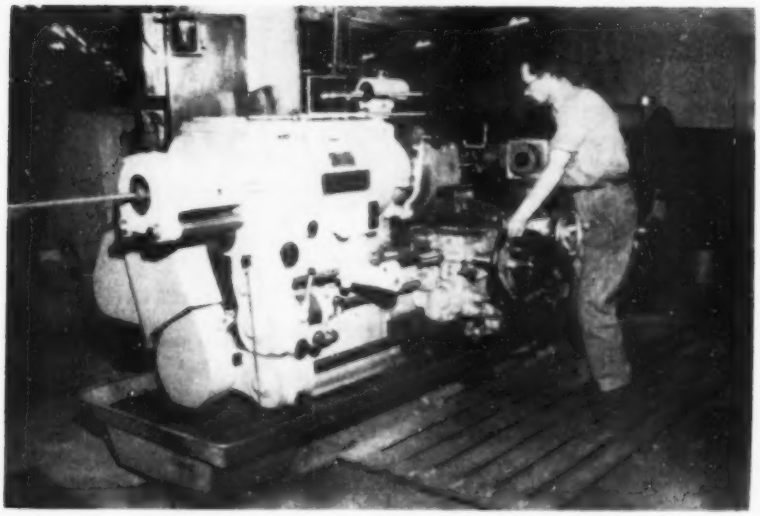

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MONARCH 18 x 48, 1942, Ser. #16073

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CANEDY OTTO 3'7" Radial
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BARNES Mod. 242, #5 MT
BARNES Mod. H-3, Hydram, 1941
NATCO D-13-H, Multiple Spdl., Hyd.
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2—GISHOLT No. 5
LIBBY No. H-5
WARNER & SWASEY No. 1A, Pre., 1942
WARNER & SWASEY No. 2A, Pre., 1942
GISHOLT No. 3R
GISHOLT No. 3L, Tapper attch., BF, Cross Slide Turrets, 1936
WARNER & SWASEY No. 4A Chucker, Ser. #298000
4—FOSTER Fastermatics, No. 4, FU
2—BARDONS & OLIVER No. 2, Elec.
2—WARNER & SWASEY No. 3, BF

GOULD & EBERHARDT 32" Shaper, 1942

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GIDDINGS & LEWIS No. 30, 3" Hor. w/2 Aux. Ser. #4806
BULLARD 24" Vert. 1940, Ser. #16817
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CINCINNATI No. 1-12, SAIMP No. 2 Vert., New
KEARNEY & TRECKER No. 3H, 1943
INGERSOLL Duplex 24" x 36", 1942
CINCINNATI No. 4-48 Production
MILWAUKEE No. 2H Plain Hor., 1940

GRINDERS

DO-ALL 6 x 18, Hyd., 1947
HEALD Rotary Surf. No. 22, 1942
NORTON Ang. 10" x 36", Ser. #16604
HEALD Mod. 72A-5 Int. Surf. Ser. #15279
BRYANT No. 24-36
K.O. Lee Tool & Cutter, 1940, Ser. #1835
LANDIS 6 x 18 Cyl., 1943

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CONE 1⅞", 8 Spdl., 1942
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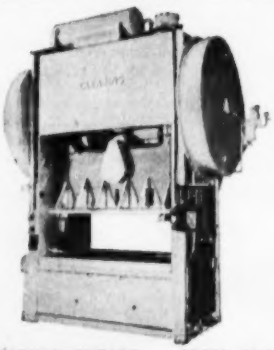

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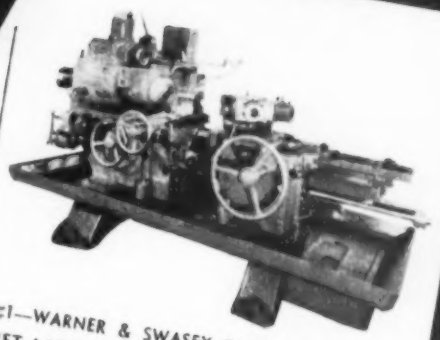

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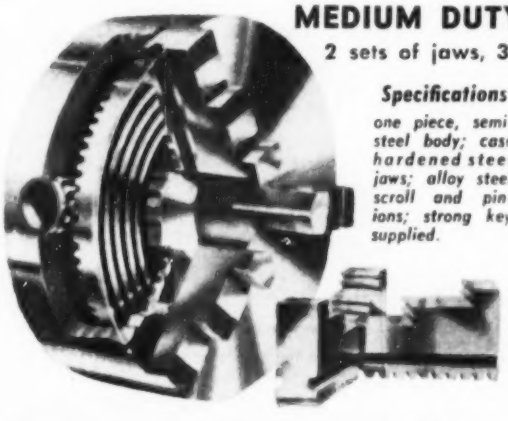

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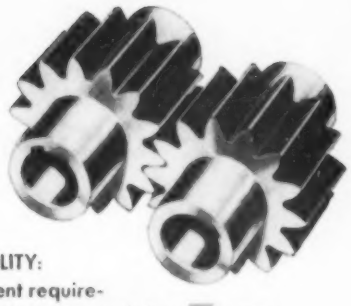

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SAVE CAPITAL INVESTMENT—A single spindle equipped with an AMF Wahlstrom Chuck does the work of *several* spindles . . . makes it practical to drill, ream and counterbore many different size holes successively, *without moving the work.* Model "A" (shown) available in two capacity ranges: 1/64" to 3/8" and 1/32" to 1/2". Other models for larger tools.

Ask your local industrial or machinery distributor for demonstration or write us direct for illustrated folder.

WAHLSTROM/FLOAT-LOCK SALES DEPT. (AM-2)
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY, 511 Fifth Ave., New York 17, N. Y.

amf WAHLSTROM® CHUCKS AND TAPPING ATTACHMENTS FULLY-AUTOMATIC

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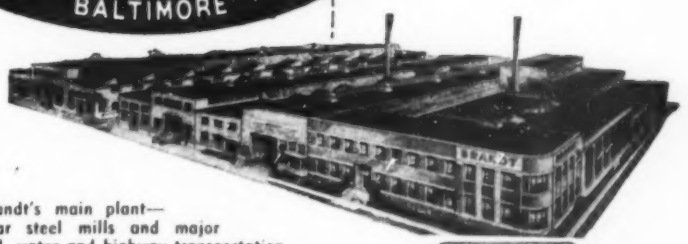

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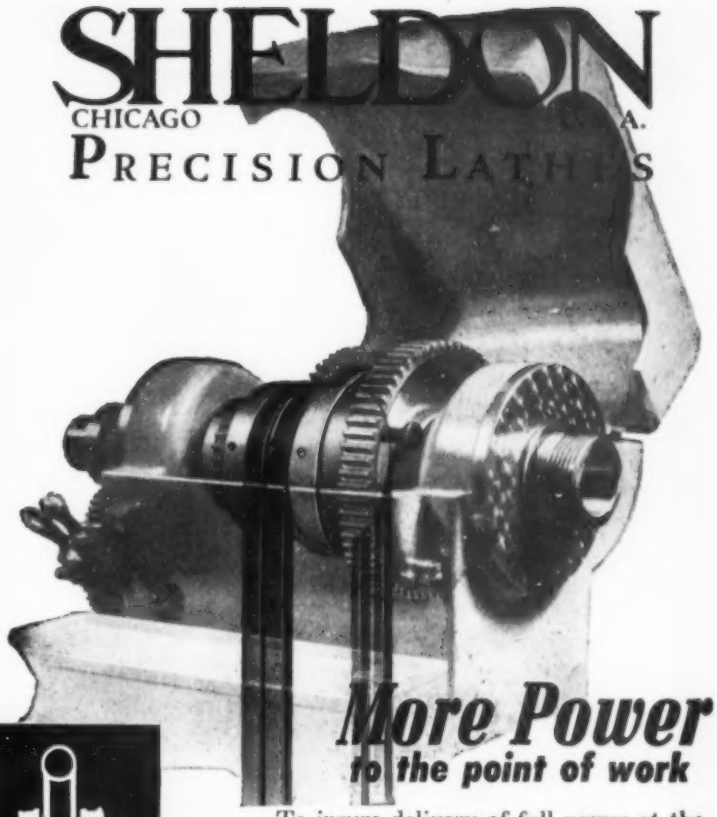
SHELDON

CHICAGO U.S.A.

PRECISION LATHES



More Power to the point of work

To insure delivery of full power at the point of work . . . to prevent slippage on heavy cuts, the underneath motor drives of SHELDON Precision Lathes have double V-Belts driving the spindle. Tandem V-Belts, each of which engages the spindle around a full 50% of its circumference.

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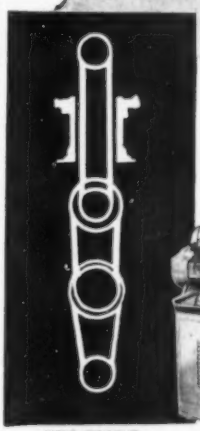
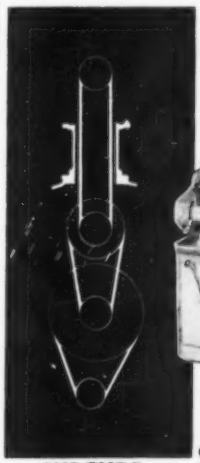
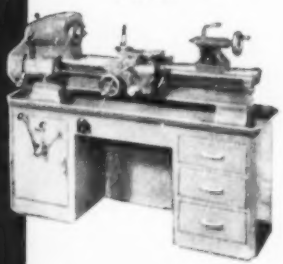


"E" TYPE

Completely enclosed in the cabinet leg, the the SHELDON Type "E" Underneath Motor Drive has matching 4-step, V-Belt sheaves which provide 4 speeds (8 spindle speeds). All belts are provided with individual means for permanent adjustment of tension.



"U" TYPE



With a SHELDON Type "U" Underneath Motor Drive, all speed changes are instant—are made by clutches operated by levers that are conveniently located outside the enclosed cabinet leg. 4-speeds (8 spindle speeds) and individual belt tensioning means are provided.

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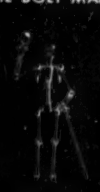

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PAWTUCKET
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THE PLACE TO SOLVE YOUR BOLT PROBLEMS

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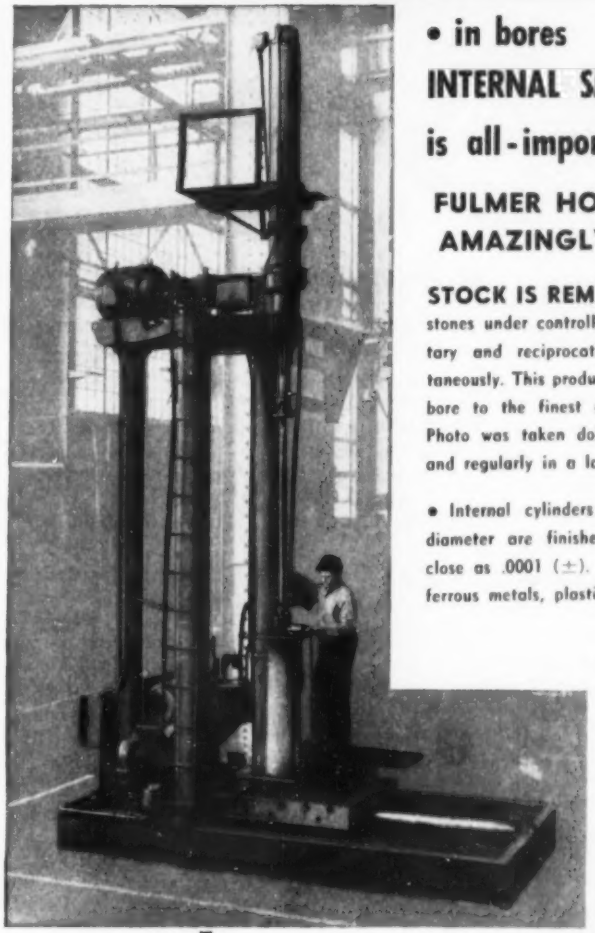
for fast precision finishing of internal cylinders



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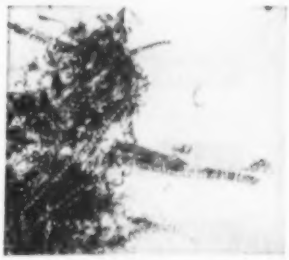

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6. **Increased Speeds:** Superior alignment and control of cutting operation safely permit stepped-up speeds.

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ERICKSON TOOL COMPANY

2321B HAMILTON AVE. • CLEVELAND, OHIO

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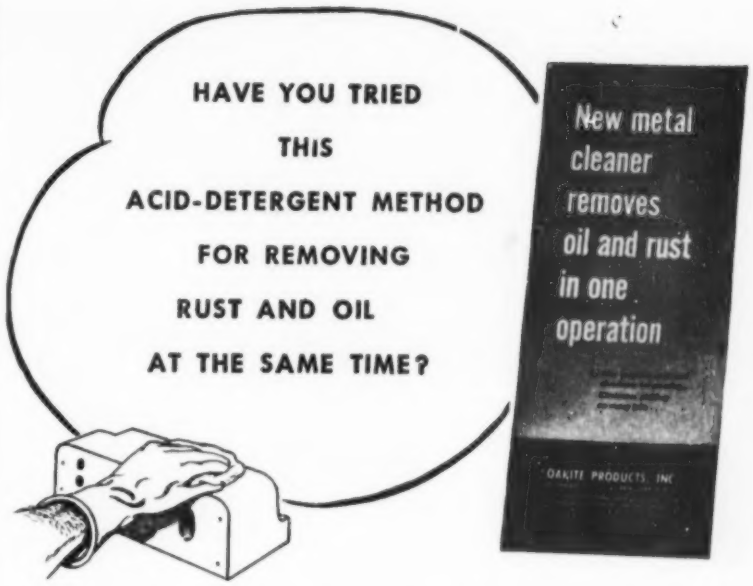


Metal craftsmen using Oakite Compound No. 33 say it is just what they've been looking for: a metal-cleaner that combines three important operations into one:

1. **It removes rust** *at the same time that*
2. **It removes oil** *at the same time that*
3. **It prepares the metal for painting**

Oakite Compound No. 33 removes rust, heat scale, tarnish, other oxides, stamping and forming oils, rust preventives, carbon smuts, soldering and welding fluxes, identification inks and similar soils. It develops excellent paint adhesion on steel, cast iron, aluminum sheet and castings.

For Use in Tanks or by Hand—Oakite Compound No. 33 is great for soak-cleaning metal parts of moderate size; and great for hand-swabbing on large metal surfaces.

Often Avoids Pickling—Oakite Compound No. 33 removes rust and oil so successfully that it frequently eliminates the need for a cycle of separate cleaning, pickling, neutralizing and paint-conditioning operations. It saves money in many ways.

FREE For a copy of "*New metal cleaner removes oil and rust in one operation*", write to Oakite Products, Inc., 24 Rector St., New York 6, N. Y.

Users Are Saying Good Things About Oakite Compound No. 33

PENNSYLVANIA: "Well pleased with removal of drawing compound, heat scale, rust and oil. Parts coming through good and clean."

CALIFORNIA: "This material is a beauty . . . one we've been waiting for on this jeep overhaul job."

MICHIGAN: "Removes oil, rust and scale faster . . . Increases adherence of rubber to steel for motor mounts and bumpers."

MICHIGAN: "Removing rust for less than 9 cents per wheel; sand blasting cost 25 cents."

TEXAS: "Eliminates practically all rejects and also handwiping of booster caps."

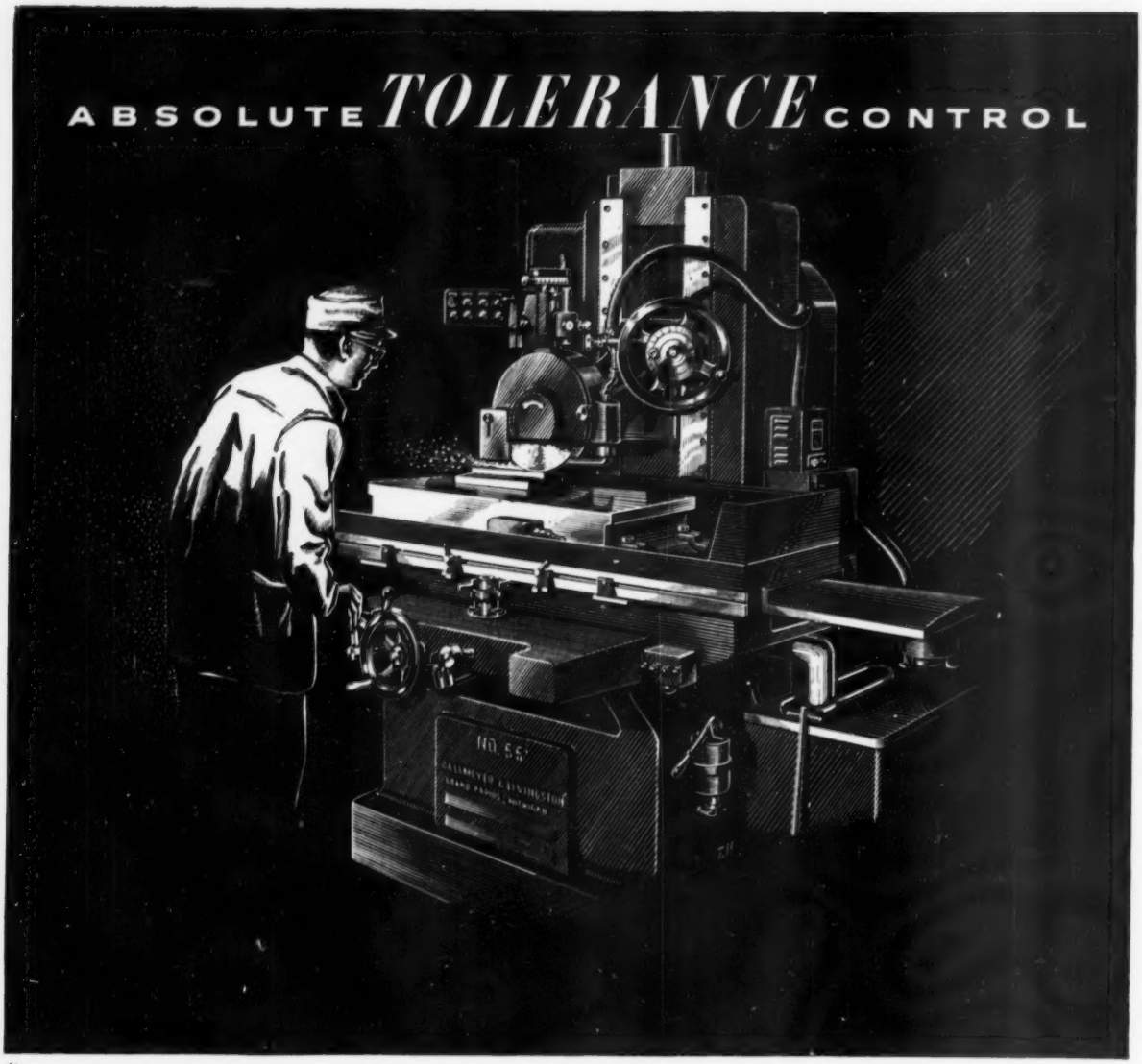
NEW YORK: "Have never seen such clean parts with such perfect paint adhesion . . . Putting Oakite Corapound No. 33 in specification sheets for sub-contractors on these registers."

ILLINOIS: "Works a miracle taking heavy rust off steel cabinets."

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE

Technical Service Representatives Located in Principal Cities of U. S. & Canada

ABSOLUTE *TOLERANCE* CONTROL



When job specifications leave no leeway, when extreme tolerances must be maintained . . . that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it impossible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you.

GALLMEYER & LIVINGSTON CO.
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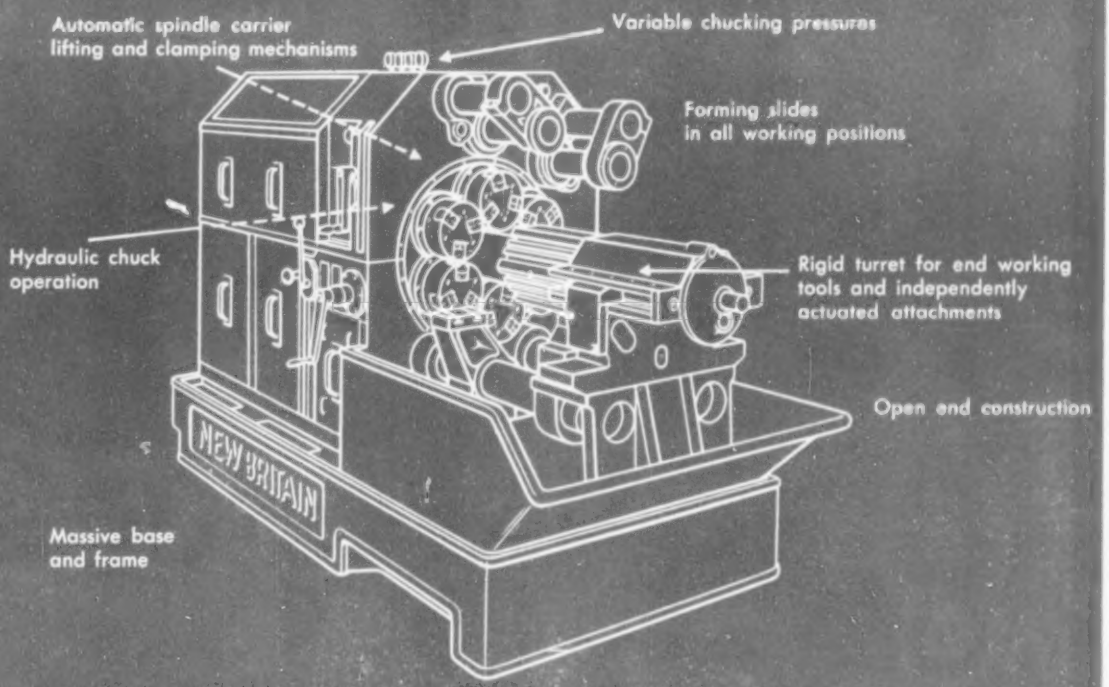
GRAND RAPIDS GRINDERS

. . . the very best

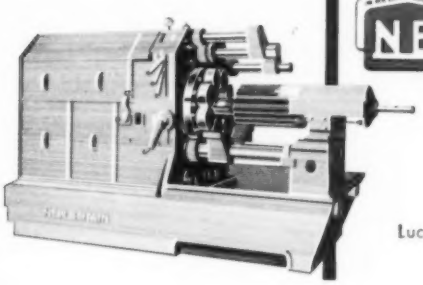
Manufacturers of
SURFACE GRINDERS • CUTTER and TOOL GRINDERS • TAP and DRILL GRINDERS

New Britain Builds 4, 6 and 8 Spindle Automatic

CHUCKING MACHINES


Automatic spindle carrier lifting and clamping mechanisms
Variable chucking pressures
Forming slides in all working positions
Hydraulic chuck operation
Rigid turret for end working tools and independently actuated attachments
Open end construction
Massive base and frame
NEW BRITAIN

A chucker designed with the extra power and rigidity for multiple operations on forgings and castings, involving both heavy and finishing cuts.



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THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut

. . . *Machines for Making Progress*

Automatic Bar and Chucking Machines
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Lucas Horizontal Boring, Drilling and Milling Machines
New Britain "GF" Copying Lathes

NEW BRITAIN *Automatics*

Does 98 operations every 1.1 minutes with help of 216 TIMKEN® bearings

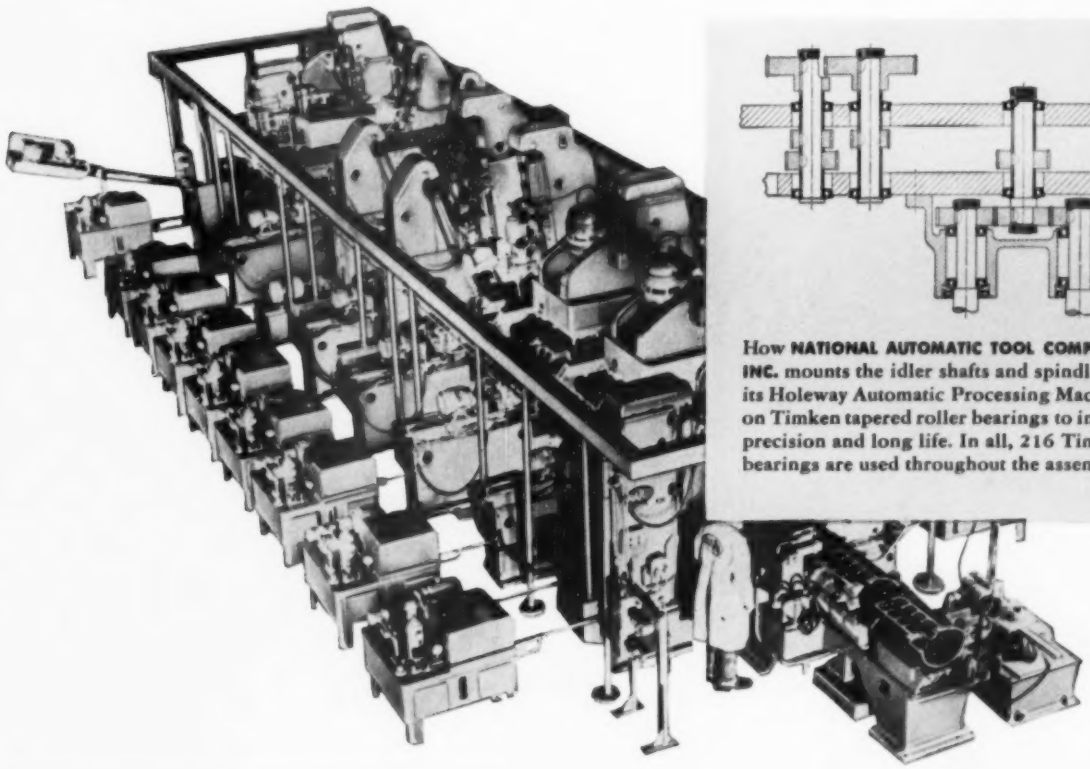
THIS Natco Holeway Automatic processing machine completes 98 pan face operations on an engine block every 1.1 minutes! Besides milling, drilling, trepaning, counterboring, reaming and chamfering, it automatically inspects the finished block! To insure precision and long life, National Automatic Tool Company, Inc. mounts the idler shafts and spindles on Timken® tapered roller bearings, and uses a total of 216 Timken bearings throughout the assembly.

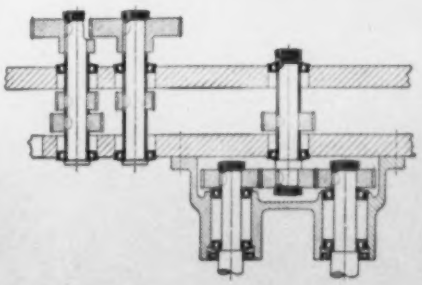
Because of their tapered construction, Timken bearings take radial and thrust loads in *any* combination. And line contact between rollers and races gives them extra load-carrying capacity. Shafts are held in rigid alignment. Gears mesh smoothly and accurately.

The true rolling motion and incredibly smooth finish of Timken bearings practically eliminates friction. They hold shafts and housings concentric, making closures more effective. Lubrication time and material costs are cut.

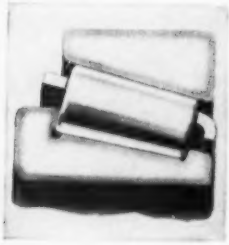
Timken bearings are engineered for the job, precision manufactured, and made of special analysis Timken fine alloy steel. Normally, they last the life of the machine. No other bearing can give you all the advantages you get with Timken tapered roller bearings. Specify them in the machines you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **NATIONAL AUTOMATIC TOOL COMPANY, INC.** mounts the idler shafts and spindles of its Holeway Automatic Processing Machine on Timken tapered roller bearings to insure precision and long life. In all, 216 Timken bearings are used throughout the assembly.



GREATER LOAD AREA

Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION ✳